Manual Lymph Drainage Vodder (MLDV) Increases Facial Function in Bell's Palsy Patients

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Background: Commonly, Bell's palsy has been treated with conventional therapy, which can cause secondary effects. On the other hand, manual lymph drainage Vodder (MLDV) is an intervention aimed at reducing edema in lymphatic cases. The use of MLDV as an intervention for Bell's palsy has not been extensively studied.

Objectives: The objective of this study was to investigate the effect of MLDV on facial function in patients with Bell's palsy.

Methods: This was a retrospective study conducted on 125 patients with Bell's palsy, comparing group 1 (MLDV) with group 2 (standard interventions). The study was conducted in Surabaya, Indonesia, from 2017 to 2024. The interventions were administered three times a week for 40–50 min until the patient was declared recovered. The measurements in this study were facial function (House–Brackmann (HB)) and facial muscle strength (manual muscle test).

Results: Statistical analysis using the Wilcoxon test for each group consistently showed $p < 0.05$ in both facial functional assessment and facial muscle strength. The Mann–Whitney analysis between groups also consistently indicated $p < 0.05$ for both functional and muscle strength assessments of the face. However, the mean difference was greater in group 1 than in group 2. The mean HB difference in group 1 was −2.11, while in group 2 it was −0.61. The mean muscle strength differences in group 1 was 2.43 and that in group 2 was 0.56.

Conclusions: MLDV can be used to improve facial function in Bell's palsy cases without the potential for side effects compared to conventional therapy.

KEYWORDS: MLDV; Bell's palsy; House–Brackmann; facial function

INTRODUCTION

Acute peripheral paralysis of the seventh nerve, or Bell's palsy, is caused by edema of the facial nerve, though the exact cause of this condition remains unknown.(1) The peak occurrence of Bell's palsy is in individuals aged 15–45 years, accounting for 75% of cases of facial nerve paralysis.(2) Various incidence and prevalence rates have been recorded in medical literature, depending on the geographic area under investigation. Bell's palsy is one of the most common cranial mononeuropathies, affecting both sexes equally, and is more prevalent in middle and late life, although it can occur at any age. Population incidence rates vary from 11.5 to 40.2 per 100,000. Research indicates similar annual incidences in the United States (25–30/100,000), Japan (30/100,000), and the United Kingdom (20.2/100,000).(3) The majority of studies report an annual incidence rate of 11–40 cases per 100,000, with extremes ranging from 8 to 240 cases. Variations in incidence are influenced by factors such as climate, racial composition, prevalence of predisposing diseases, and demographics of the studied region.(4)

Although the exact incidence of Bell's palsy in Indonesia is unknown, it is considered common, with cases accounting for 19.55% of all neuropathy cases. Most occurrences happen in the 20- to 50-year

age range, and the prevalence increases with age after 60 years. Approximately 60–85% of patients recover fully within 3 weeks, while 15% take 3 months. However, 30% of those who do not improve within 4 months are left with permanent impairments.[5,6] While Bell's palsy affects men, women, and children, it is more common in the 15- to 45-year age group, in people with diabetes, upper respiratory infections, weakened immune systems, and in pregnant women.[7] The recurrence rate varies between 0.8% and 19.4%, with an average of 6.5% in individuals who have had a prior episode.[8] The prognosis is not affected by whether the recurrence occurs on the same side as the initial episode. Sixty-six percent of patients recover completely, but those with recurrent Bell's palsy tend to have poorer outcomes than those experiencing it for the first time.[8]

Bell's palsy causes partial or complete immobility of the facial muscles. While facial paresis or paralysis is usually self-limiting, it can lead to temporary issues, such as oral incompetence and difficulties closing the eyelids, which may potentially result in ocular damage. Additionally, long-term complications may arise, affecting the patient's quality of life. The primary goal of treatment is to improve facial function and support recovery.[9] Bell's palsy is typically diagnosed clinically, characterized by the sudden onset of unilateral lower motor neuron facial paralysis affecting both upper and lower facial muscles, which peaks within 72 h. Patients often present with associated symptoms such as dysgeusia, hyperacusis, altered facial sensation, or pain around the neck, mastoid, or ears. These accompanying symptoms occur in 50–60% of cases. Most patients recover spontaneously without medical intervention.[7] However, one in three patients (29%) is left with long-term deficits in facial function following incomplete recovery.[10] This may affect essential functions such as speech, eating,[11] as well as non-verbal communication involving emotional expressions, such as smiling, and result in chronic facial pain.[12] Individuals with incomplete recovery often experience prolonged depression and psychological distress, leading to social withdrawal and isolation.[13,14] Untreated complications such as speech difficulties, corneal ulcers, loss of taste, facial contractures, and synkinesis of the eyes and mouth can have severe consequences.[15]

Patients with Bell's palsy require therapy to manage their condition. Physiotherapy techniques aimed at retraining facial muscles can help prevent muscle contractures and atrophy.[16] Manual lymphatic drainage Vodder (MLDV) of the face is one physiotherapy technique that addresses the problems faced by patients with Bell's palsy.[13,17] Through increased lymph circulation, accelerated removal of biochemical waste from body tissues, enhanced body fluid dynamics (which reduces edema), decreased sympathetic nerve response, and increased parasympathetic nerve tone (which reduces skeletal muscle stress in Bell's palsy patients), this physiotherapy intervention technology stimulates the lymphatic system.[18] Regarding sports injuries, the MLDV approach is effective in reducing sympathetic nerve reactions and edema. It can reduce edema in cases of ankle injuries.[19] Furthermore, other research results demonstrate that MLDV has been proven effective in reducing lymph gland edema.[20] Experts use this technique for various conditions, including shoulder pain, lymphedema, ankle injuries, and other muscle and nerve diseases.[21]

Research on the effects of MLDV on Bell's palsy is still limited. Previous studies have only shown that MLDV can be used to reduce pain and induce relaxation for facial palsy.[22] Therefore, this study is crucial for further examining the effects of MLDV on muscle strength and facial function. Theoretically, if a person possesses normal muscle strength, they should be able to perform functional tasks well. The strength of facial muscles directly impacts the ability to execute facial function, such as speaking, eating, expressing emotions, and maintaining good facial posture. A decline in facial muscle strength can impair the ability to perform these tasks. Facial muscle strength is critical in supporting daily functional activities.[23] This study aims to investigate the effect of MLDV on Bell's palsy facial function and facial muscle strength.

METHODS

This research is a retrospective data collection to compare intervention between

two groups. This retrospective study aims to evaluate the effectiveness of MLDV by comparing clinical outcomes between two distinct patient groups. Ethical approval for the research was granted by the Health Research Ethics Committee of St. Vincentius a Paulo Catholic College of Health Sciences Surabaya, under the number No. 001/Stikes Vine/KEPK/V/2024. Retrospective data collection, based on medical records from 2017 to 2024, was conducted between June and August 2024, covering 219 cases of facial paralysis in St. Vincentius a Paulo Hospital, Surabaya, East Java, Indonesia.

The research subjects were patients with Bell's palsy who met the criteria. The inclusion criteria were a medical diagnosis of Bell's palsy and referral to physiotherapy. Comorbidities such as hypertension and diabetes mellitus were also taken into account in this study. The exclusion criteria included incomplete medical data, such as disease history and evaluation. The dropout criteria were defined as fewer than five therapy sessions, as recorded in the medical record. The subjects were divided into two groups not randomly, but based on the intervention received from the medical records. The treatment group received only direct therapy, while the control group received both direct and indirect therapy. The ratio of direct therapy between the treatment group and the control group was 1:1. Group 1 received MLDV therapy (see Figure 1), while group 2 was the control group receiving the hospital's standard modalities, including electrical stimulation (ES) (galvanic), shortwave diathermy (SWD), and massage.

The research followed procedures in place at St. Vincentius a Paulo Catholic Hospital, with both groups receiving interventions three times a week for 40–50 min per session. Post-test evaluations were conducted until the subjects recovered from Bell's palsy, with the number of therapy sessions varying between patients. Evaluations were conducted every five therapy sessions until the patient had recovered.

The principle of MLDV involves gentle strokes applied to the lymphatic vessels, nodes, interstitial fluid, and veins to optimize the flow rate of body fluids. MLDV is performed in several stages (see Figure 1): (i) beginning with the basic effleurage technique in the chest area, (ii) basic movements on the neck, (iii) effleurage on the face from medial to lateral over the neck, chin, lower lip, upper lip, nose, and forehead, followed by two circles (locomotive movements) on the cheeks, ending under the chin, (iv) repetitive movements around the mouth, nose, eyes, and forehead, (v) finishing with effleurage, and (vi) breathing exercises between segment transitions. Physiotherapists who perform MLDV have been certified by Vodder.

The control group received ES, SWD, and facial massage. The type of current used was galvanic stimulation (continuous direct current). Electrode placement involves positioning the active electrode on the motor points of the facial muscles (such as the frontalis, orbicularis oculi, zygomaticus, orbicularis oris, etc.), while the passive electrode is placed on the upper neck area. The stimulation frequency for each point is 10 muscle contractions per point. This procedure is repeated three times, resulting in a total of 30 contractions per point. The current intensity is set at 1 mA. Typically, each contraction lasts for 3–5 s, with an interval of 5–10 s between contractions. SWD is applied to the ear area for 15 min. Massage was given to the facial area using effleurage, kneading, and tapotement techniques for 15 min.

Additionally, both groups were given a home program involving facial exercises. The home program consisted of facial muscle exercises performed in front of a mirror, during which patients were instructed to

Figure 1. Technique of MLDV. MLDV = Manual Lymph Drainage Vodder.

actively move facial muscles (such as raising eyebrows, smiling, and inflating the cheeks), as well as perform light facial massage to stimulate muscle activity. These exercises were to be performed for 15 min in the morning and evening. All patients were educated at the end of each therapy session. The educational content included (i) avoiding direct exposure of the face to wind, such as from fans or air conditioning, to prevent irritation and worsening of nerve function, and (ii) use of artificial tears, if patients experienced dry eyes due to weakness of the orbicularis oculi muscle. These instructions and educational points were delivered verbally and through direct demonstration by the physiotherapist after each therapy session. Evaluation was conducted at the beginning of the following session through brief interviews and observation of facial movements to ensure proper adherence to the home program and recommendations. This approach was implemented to control for external variables that could influence treatment outcomes and to ensure that both groups received consistent interventions throughout the study period.

The measurements in this research for both groups included facial function movement assessed using the House–Brackmann (HB) scale and muscle strength assessed using facial manual muscle test (MMT). The patient's measurements were recorded before the treatment and then every five treatments until the patient was declared cured. The HB scale was used to determine the severity of Bell's palsy based on facial function, categorized from grade 1 to 6—grade 1 for no paralysis and grade 6 for complete paralysis. MMT for facial muscle strength measurements has demonstrated good overall validity, with intraclass correlation coefficients and total score correlations ranging from 0.57 to 1.00.[24] To maintain consistency of the results, participants in each group were evaluated by the same examiner (intra-rater) for both pre- and post-tests. However, different examiners assessed the control and intervention groups, thereby involving aspects of inter-rater reliability as well. Muscle strength involved the frontalis, corrugator supercilii, orbicularis oculi, zygomaticus major, orbicularis oris, nasalis, buccinator, and risorius muscles, with assessments on a scale of 0, 1, 3, and 5.

RESULTS

The medical record notes revealed 150 subjects with Bell's palsy. However, 25 subjects dropped out, leaving 125 subjects, with 74 in group 1 and 51 in group 2 (see Figure 2). The subjects included both male and female patients who experienced Bell's palsy and were referred to physiotherapy at St. Vincentius a Paulo Catholic Hospital Surabaya.

The characteristics of the research subjects include age, gender, number of therapy sessions, HB functional scale, and facial strength (see Table 1). The group averages for these variables were relatively similar, with Levene's test for homogeneity indicating $p > 0.05$, confirming that variances between groups were not significantly different.

The normality test for both groups, conducted using the Kolmogorov–Smirnov test, showed a p-value < 0.05, indicating that the data distribution was not normal. Therefore, a non-parametric analysis was used to test the hypothesis. The Wilcoxon statistical test within each group showed a p-value of 0.000 for both groups. The Mann–Whitney statistical test between the groups also indicated a p-value of 0.000 (see Table 2).

The analysis results showed a significant difference between the two groups in functional measurements using the HB scale. A lower HB score indicated better improvement. Mean difference in group 1 was −2.11 and that in group 2 was −0.61. Group 1 demonstrated a larger difference compared to group 2 (see Figure 3), indicating that the treatment in group 1 had a greater effect than in group 2.

The analysis also revealed a significant difference between the two groups in facial muscle strength measurements. A higher facial muscle strength score indicated better improvement. The average facial muscle strength in group 1 showed a greater difference after treatment, while in group 2, the difference was not as pronounced. The average muscle strength differences in group 1 were as follows: frontalis at 2.39, corrugator supercilii at 2.35, orbicularis oculi at 2.12, zygomaticus major at 2.56, orbicularis oris at 2.48, nasalis at 2.71, buccinator at 2.35, and risorius at 2.5. In group 2, the average muscle strength differences were as follows: frontalis at 0.60, corrugator supercilii at 0.64, orbicularis oculi at 0.68,

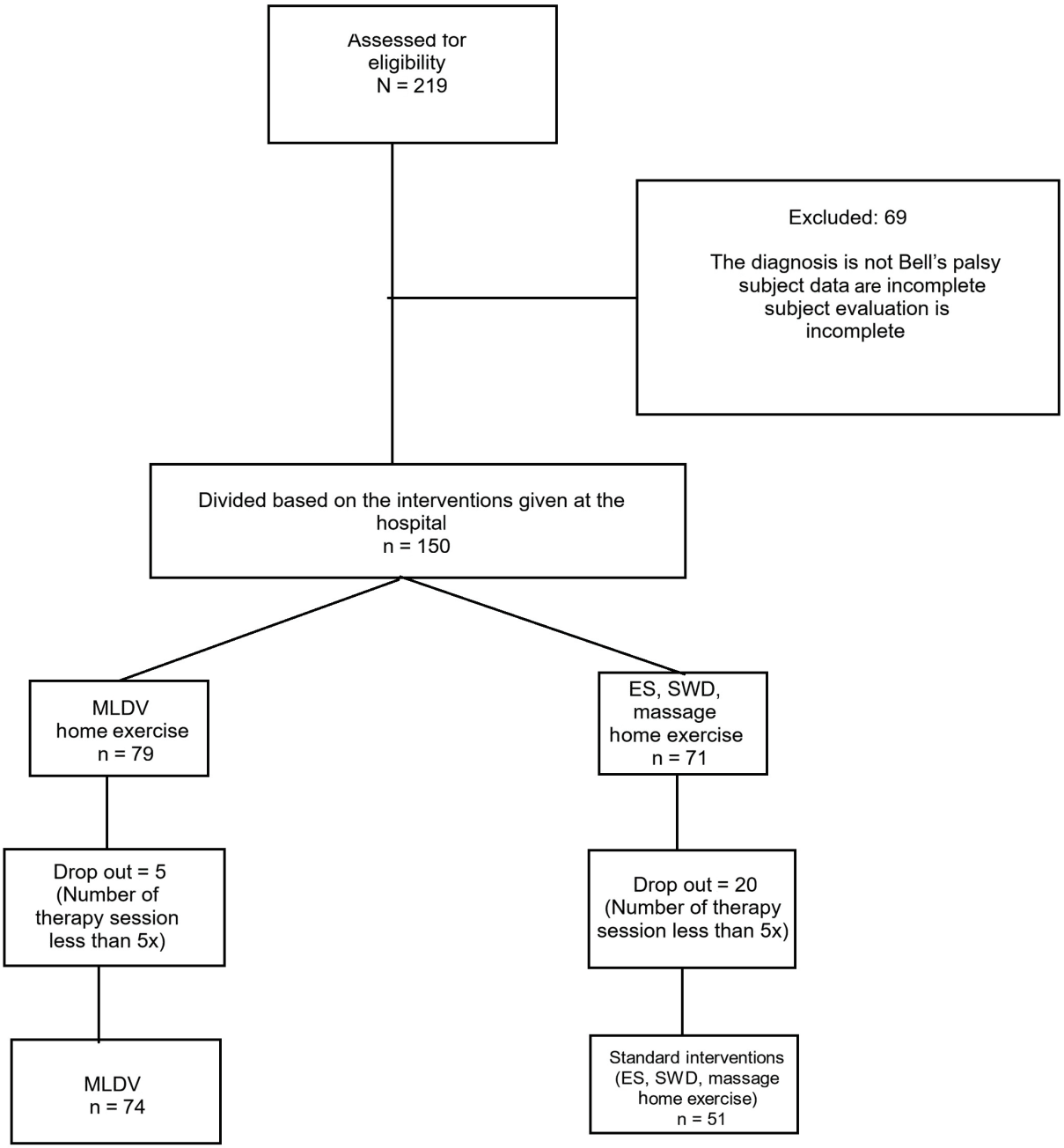

Figure 2. Flowchart for participant recruitment and allocation. ES = Electrical Stimulation; MLDV = Manual Lymph Drainage Vodder; SWD = Shortwave Diathermy.

zygomaticus major at 0.5, orbicularis oris at 0.62, nasalis at 0.5, buccinator at 0.43, and risorius at 0.58 (see Figure 4).

DISCUSSION

The results of this study show that the average age of the respondents falls within the productive age range (44.58 ± 15.88 years and 39.96 ± 13.49 years). According to theory, although Bell's palsy can occur at any age, research indicates that it most frequently affects individuals within the productive age range, typically between 20 and 50 years old. The highest incidence occurs in young to middle-aged adults, with a peak prevalence between the ages

TABLE 1. Subject Characteristic

	Group 1 (n = 74)	*Group 2 (n = 51)*	*p-Value*
	Mean ± SD	*Mean ± SD*	
Age (year)	44.58 ± 15.88	39.96 ± 13.49	0.090
Gender			0.445
Male	36 (48.6%)	21 (41.2%)	
Female	43 (51.4%)	30 (58.8%)	
Therapy frequency	7.86 ± 4.71	6.92 ± 3.14	0.214
Functional (baseline)	4.35 ± 0.91	4.25 ± 0.84	0.399
Muscle strength (baseline)			
Frontalis	1.51 ± 1.52	1.17 ± 1.32	0.302
Orbicularis oculi	1.85 ± 1.45	1.82 ± 1.41	0.972
Corrugator supercilii	1.63 ± 1.39	1.47 ± 1.43	0.411
Zygomaticus mayor	1.04 ± 1.17	1.03 ± 1.35	0.734
Orbicularis oris	1.06 ± 1.19	1.21 ± 1.27	0.529
Nasalis	0.87 ± 1.18	0.84 ± 1.15	0.980
Buccinator	1.14 ± 1.13	1.29 ± 1.15	0.519
Risorius	0.93 ± 1.11	0.84 ± 1.01	0.599

SD = Standard Deviation.

TABLE 2. Statistical Analysis

Variable	*p-Value of Each Group*		*p-Value of Between-Groups*
	Group 1 (n = 74)	*Group 2 (n = 51)*	
HB	<0.001	<0.001	<0.001
MMT			
Frontalis	<0.001	<0.001	<0.001
Orbicularis oculi	<0.001	<0.001	<0.001
Corrugator supercilii	<0.001	<0.001	<0.001
Zygomaticus mayor	<0.001	0.001	<0.001
Orbicularis oris	<0.001	0.002	<0.001
Nasalis	<0.001	<0.001	<0.001
Buccinator	<0.001	0.020	<0.001
Risorius	<0.001	0.002	<0.001

HB = House–Brackmann; MMT = Manual Muscle Test.

of 30 and 40 years.[25] In addition to lifestyle and stress, a combination of infections and environmental exposure also contributes to the occurrence of Bell's palsy in this age group.[26] Although there have been many studies in Indonesia on the treatment and education of risk factors for Bell's palsy, data showing the influence of stress and

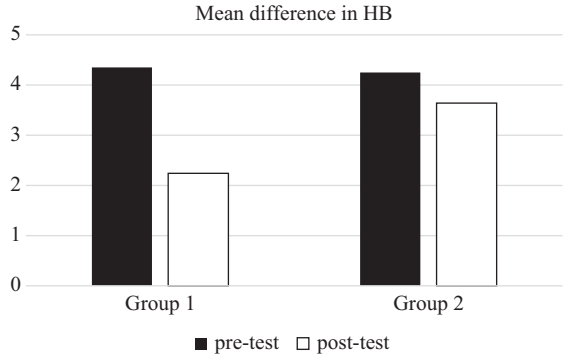

Figure 3. House–Brackmann between groups. HB = House–Brackmann.

lifestyle factors that cause Bell's palsy are still unclear. There are no national studies that have published representative prevalence figures for Bell's palsy in Indonesia, but there are studies on public education regarding the risk factors of hypertension, diabetes, and obesity for Bell's palsy.[27] A healthy lifestyle, such as good nutrition, simple stress management, facial exercises, and family/community support, has been shown to have positive results in recovery and prevention.[28]

The subject's characteristics influencing Bell's palsy include a history of comorbid conditions. Comorbidities such as hypertension, high cholesterol, and diabetes mellitus were also taken into account in this study. Individuals with diabetes mellitus are more susceptible to Bell's palsy due to mononeuropathy.[29] Previous studies have indicated that hypertension increases the risk of Bell's palsy in individuals over 40 years old.[30,31] Another study also found that Bell's palsy poses a risk for individuals with hypertension and diabetes mellitus.[31]

The productive age is often associated with high stress levels due to work, family, and social demands. Stress is known to weaken the immune system, increasing the risk of viral infections such as herpes simplex virus (HSV) and varicella zoster virus, which are among the primary causes of Bell's palsy.[32] These infections occur mainly in individuals with weakened immune systems due to stress or other medical conditions. Lifestyle factors such as prolonged exposure to wind on the face and lack of sleep—more common in the productive age group—can also increase the risk of Bell's palsy. These habits can affect the immune system and contribute to inflammation of the facial nerve.

According to the results of this study, the majority of respondents (over 50%) in both groups were women.[33] Previous research has shown that women experience Bell's palsy more frequently than men, particularly between the ages of 20 and 40 years.[34] A study conducted in Sweden found that the incidence of Bell's palsy is higher in women, especially during pregnancy and the postpartum period, with a ratio of 1.3:1 compared to men.[35] The increased prevalence of Bell's palsy in women is not only linked to hormonal changes but can also be attributed to autoimmune diseases or metabolic disorders such as diabetes.[26,36] Several studies have shown that HSV-1 infection and other factors such as virus reactivation more frequently affect women, particularly those with immune disorders or chronic stress, and hormones like estrogen play a role in increasing the risk of Bell's palsy. Estrogen is known to have immunomodulatory effects that can influence the inflammatory response to viral infections or nerve trauma.[37] Bell's palsy occurs due to inflammation and swelling of the facial nerve, leading to impaired nerve signal transmission. In women, several pathophysiological mechanisms contribute, including hormonal fluctuations, especially during the menstrual cycle, pregnancy, or menopause, which can affect the facial nerves and blood vessels, increasing the risk of Bell's palsy. In addition, different immune responses cause women to tend to have a stronger immune response than men, which can lead to excessive inflammation of the facial nerve in cases of infection or trauma. Furthermore, increased fluid retention or changes in blood flow during pregnancy or menstruation can cause facial nerve compression, triggering symptoms of Bell's palsy.[38]

Research on the effects of MLDV on Bell's palsy is still limited, meaning references on this topic remain scarce. Nevertheless, the influence of MLDV on Bell's palsy can be associated with the mechanism of increased lymphatic circulation due to light pressure on the skin, which enhances immune cell activity and reduces inflammation, particularly in the facial nerve (nervus facialis). When a virus enters the body, it can spread in the interstitial fluid, increasing pressure and causing interstitial fluid to flow into the lymphatic vessels, where it circulates. This process stimulates the activation of

immune cells (T-cells) to eliminate foreign bodies, including viruses.[39] The flow of lymphatic fluid can be enhanced by pressure, which is referred to as intrinsic and extrinsic pumps. The intrinsic pump is driven by the contraction of lymph vessel walls and the opening and closing of lymphatic valves, while the extrinsic pump results from muscle contractions, respiration, and pressure applied to parts of the body.[40,41] To generate the extrinsic pump, manual lymphatic drainage techniques, such as those developed by Vodder (MLDV), are used. These involve gentle hand movements on the skin, utilizing techniques like pump, scoop, rotary, stationary circle, and thumb circle. An essential technique in MLDV for Bell's palsy patients is the basic method with profundus-terminus and fork hold, which is repeated as much as possible. The abdominal technique is applied to boost immunity, as one of the causes of Bell's palsy is a virus that can only be fought by enhancing the immune system. The face technique is also employed to maintain the physiology of facial muscles. A key MLDV technique used is palatum, which aims to improve cerebral fluid circulation since the facial nerve is the seventh cranial nerve.[42]

The effects of MLDV include stretching of lymphatic vessels and smooth muscles, increasing the frequency of lymphatic vessel contractions, creating interstitial pressure variations that speed up the filling and emptying of lymphatic valves, enhancing superficial and peripheral blood flow, increasing blood flow in the femoral vein, providing a calming effect, improving skin circulation, reducing breathlessness, and enhancing sleep quality.[43] Therefore, the effects of MLDV can enhance facial function.

Furthermore, the results of this study also indicate an improvement in facial muscle strength. In Bell's palsy, there is an issue of muscle weakness on the affected side of the face, resulting in asymmetry and an inability to perform facial functions, such as closing the eye, smiling, chewing food, drinking, and so forth, along with pain around the ear, which worsens the condition of Bell's palsy.[36] This suggests that a reduction in facial muscle strength can impact facial function. It was also found that the increase in facial muscle strength occurred in all the facial muscles studied, namely the frontalis, corrugator supercilii, orbicularis oculi, orbicularis oris, zygomaticus major, nasalis, buccinator, and risorius muscles (see Figure 4). The frontalis muscle functions to wrinkle the forehead, the corrugator supercilii brings the eyebrows together, the orbicularis oculi closes the eyes, the orbicularis oris closes the mouth, the zygomaticus major is responsible for smiling, the nasalis moves the nose, the buccinator aids in chewing, and the risorius pulls the corners of the mouth toward the cheeks.[36] Previous research on interventions for facial palsy has shown that manual lymph drainage can be used to reduce edema around the face and

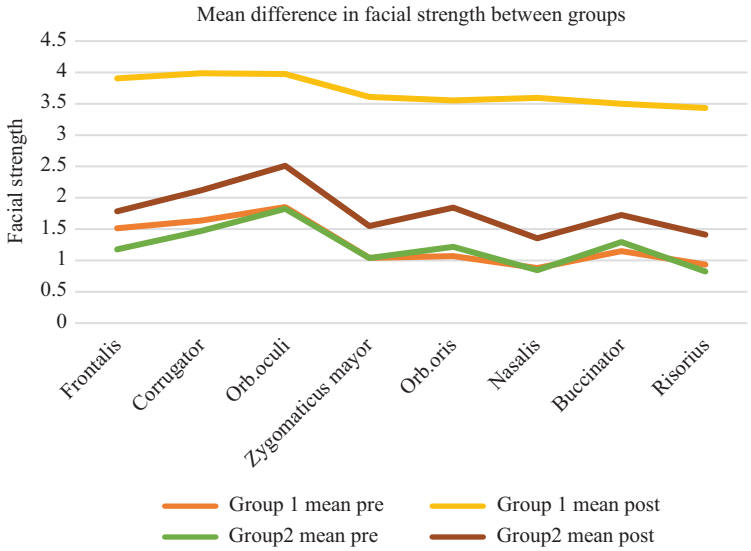

Figure 4. Facial muscle strength between groups.

provide relaxation, particularly during the acute phase. As the edema decreases, the pressure on the facial nerve is also reduced, allowing for quicker recovery of nerve function. MLDV also offers a relaxing effect on tense facial muscles, which helps reduce pain and discomfort.[22] The reduction in pain due to the application of MLDV has a positive impact on increasing muscle strength. However, this improvement in facial muscle strength is also influenced by facial exercises tailored to function, which can be performed independently by the patient.

In the control group, interventions such as ES using galvanic current, SWD, and massage also had positive effects on Bell's palsy. This aligns with findings from other studies, indicating that standard therapies for managing Bell's palsy include stretching, massage, neuromuscular re-education, myofascial release, and postural exercises. These standard therapies are often combined to achieve better outcomes in the treatment of Bell's palsy.

ES is a physiotherapy method that involves the application of electrical impulses to the facial muscles to induce muscle contractions. In this research study, the ES used galvanic current. Although this technique aims to prevent muscle atrophy during paralysis and maintain muscle tone, clinical results indicate that its effectiveness in patients with Bell's palsy is limited. ES promotes recovery of facial paralysis by nerve regeneration after peripheral nerve injuries, though its effectiveness depends on the type of injury. ES carries the risk of incorrect axonal regrowth through inappropriate pathways, resulting in excessive collateral axonal branching at the lesion site, which can lead to synkinesis—unwanted facial muscle contractions during certain movements, such as smiling while closing the eyes.[44] Additionally, ES using galvanic current is applied to facilitate muscle contractions, retrain paralyzed muscles, and prevent tissue adhesions. Compared to the MLDV group, subjects receiving ES experienced smaller improvements in facial symmetry and motor control, along with potential side effects related to ES.

SWD is a therapy that utilizes electromagnetic waves to generate heat within body tissues, aiming to enhance blood flow and reduce pain. SWD can be beneficial in managing Bell's palsy due to its heating effects, which reduce pain, enhance metabolism, improve microcirculation, and prevent muscle contractures.[45] The use of SWD should ideally be accompanied by other simultaneous interventions, such as neuromuscular ES, in the treatment of Bell's palsy.[46] However, compared to the MLDV group, the effects of SWD on facial functional improvement are not as effective.

Massage is a standard therapy used in cases of Bell's palsy, alongside stretching, neuromuscular re-education, myofascial release, and postural exercises. Many studies have shown that combining massage with more than one other intervention can positively impact Bell's palsy.[9,47] This indicates that massage alone is insufficient for improving Bell's palsy symptoms.[46] Unlike MLDV, conventional massage is not specifically designed to enhance lymphatic flow or reduce edema, both of which are critical factors in Bell's palsy recovery. Additionally, using firmer or inappropriate massage techniques may irritate sensitive facial tissues, potentially slowing recovery. Research indicates that conventional massage is less effective than MLDV in improving facial function. MLDV, with its gentler approach focused on lymphatic drainage, offers more significant advantages in terms of facial symmetry and recovery speed.

LIMITATIONS

The limitations of this study include not eliminating subjects with comorbidities, such as hypertension and diabetes mellitus, as well as those who were also taking medications. Therefore, the results may be influenced by the medications. In addition, the MLDV procedure for Bell's palsy was not standardized. There are data limitations in the collection of secondary data. Variations in therapy duration among patients, as well as other activities or interventions received, may influence the research outcomes.

CONCLUSION

This study demonstrates that MLDV can enhance facial function more effectively than standard interventions, which include ES, SWD, and massage. Therefore, MLDV can be offered to patients with Bell's palsy. Furthermore, it is recommended not only

to measure functional ability and muscle strength but also to consider other aspects related to Bell's palsy, such as pain and comorbidities. Additionally, it is necessary to reassess the management of Bell's palsy with MLDV, which should be combined with other interventions to achieve better outcomes.

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CONFLICT OF INTEREST NOTIFICATION

The authors declare there are no conflicts of interest.

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ETHICAL APPROVAL STATEMENT

Ethical approval for this study was obtained from the Health Research Ethics Committee (KEPK) of STIKES Katolik St. Vincentius a Paulo Surabaya (Ethical Approval No. 001/Stikes Vinc/KEPK/V/2024) prior to data collection. All participants provided written informed consent before participation.

AUTHOR CONTRIBUTIONS

All authors contributed to the conception and design of the study, data collection, analysis, and manuscript preparation. All authors have reviewed and approved the final version for publication.

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