ORIGINAL ARTICLE

Effects of Kabat rehabilitation versus mime therapy on facial disability and synkinesis in patients of Bell's palsy

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Abstract

Objective: : To compare the effects of Kabat rehabilitation and Mime therapy on facial disability and synkinesis in patients with Bell's palsy.

Method: The single-blind, randomised clinical trial was conducted at the Physiotherapy Department of the University of Lahore Teaching Hospital, Lahore, Pakistan, from May to October 2023, and comprised adults of either gender aged 25-50 years having sub-acute or chronic unilateral Bell's palsy of non-congenital origin. The patients were randomised into Kabat rehabilitation group A and mime therapy group B. Conventional physical therapy was given to both groups additionally. Facial disability was assessed using the Facial Disability Index scale, and synkinesis was observed using the House-Brackmann Facial Nerve Grading Scale. Data was analysed using SPSS 25.

Results: Of the 72 patients, 41(56.9%) were females and 31(43.1%) were males. The overall mean age was 37.77±6.98 years, mean body mass index was 25.71±5.71kg/m^2 and 41(56.9%) patients had left-sided palsy. Facial disability and synkinesis were significantly different in both groups post-intervention (p<0.001), while intergroup differences were significant in the 3rd and 6th weeks (p<0.001).

Conclusion: Kabat rehabilitation led to more significant improvements in synkinesis and facial disability compared to mime therapy.

Clinical Trial Number: Clinical trials.gov registration id: NCT06029855.

Keywords: Bell's palsy, Disability, Rehabilitation, Synkinesis. (JPMA 74: 1927; 2024)

DOI: https://doi.org/10.47391/JPMA.11247

Introduction

Bell's palsy is a prevalent neurological disorder characterised by rapid onset of facial muscle paralysis of the half side of the face.[1] In the United States, around 25-30 persons per 100,000 are diagnosed annually with Bell's palsy. There is no specific age limit for the occurrence of this disease, but most cases are reported at ages 15-45 years, with both genders being equally affected.[2] The exact cause of Bell's palsy is not clear, but it is attributed to viral infection or some immune response that inflames the seventh cranial nerve, often in the labyrinthine section of the facial canal, resulting in muscle weakness on one side of the face.[3]

In Bell's palsy treatment, physical therapy (PT) has been shown to provide several advantages. It focuses on muscle, and soft tissue re-education should be used to prevent muscular atrophy and the development of soft tissue contractures.[4] Electromagnetic muscle stimulation, kinesiotherapy and Kabat rehabilitation (KR) exercises on the facial muscles play an important role in gaining the functionality of paralysed facial muscles.[5] Mime therapy (MT) was developed in the 1970s by Jan Bronk and Pieter Devnese using the principles of mime. It was based on non-verbal communication that has been used for treating neurological disorders.[6] Over the decades, it has been modified based on positive experiences in Dutch medical centres to a revised form of MT that includes a combination of self-massage, relaxation, coordination exercises, joint motor inhibition practice and emotional expressions.[7] Combining MT with PT has been shown to improve facial symmetry and manage synkinesis both at rest and during exercises.[8]

The KR intervention, developed by Dr. Herman Kabat, utilises a global muscle pattern throughout the affected area, incorporating stretch, resistance and mutual inhibition for proprioceptive stimulation. KR exercises with massage involve kneading and effleurage, followed by stretching exercises to relax tense facial muscles. Patients actively engage in specific facial exercises, resisting movements with fingers to enhance muscle utilisation. This technique was drawn from proprioceptive neuromuscular facilitation (PNF), which is widely used in orthopaedic pathology,[9] post-stroke treatment, systemic sclerosis and facial nerve palsy rehabilitation.[10] Through the facilitation, inhibition and resistance of a group of muscles, the KR approach establishes a fundamental pattern of movement,

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Submission complete: 10-11-2023 **Review began:** 16-01-2024

Acceptance: 24-08-2024 **Review end:** 10-07-2024

while MT leads to an immediate improvement in the activity, integrity and strength of facial muscles.

To our knowledge, no study has analysed the comparative effects of both these techniques on patients with Bell's palsy. The current study was planned to fill the gap in the literature by comparing the effectiveness of KR and MT approaches in managing Bell's palsy symptoms.

Patients and Methods

The single-blind, randomised clinical trial was conducted at the Physiotherapy Department of the University of Lahore Teaching Hospital, Lahore, Pakistan, from May to October 2023. The study followed the Consolidated Standards of Reporting Clinical Trials (CONSORT) guidelines[11] and was registered with clinicaltrials.gov (ID: NCT06029855). After approval from the institutional ethics committee (ID: REC-UOL-406-05-2023), the sample size was calculated with the help of Open-Epi software[12] using the formula:[13]

$$n_1 = \frac{(\sigma_1^2 + \sigma_2^2 / \kappa)(z_{1-\alpha/2} + z_{1-\beta})^2}{\Delta^2}$$

$$n_2 = \frac{(\kappa * \sigma_1^2 + \sigma_2^2)(z_{1-\alpha/2} + z_{1-\beta})^2}{\Delta^2}$$

The notation for the formulae is:
n 1 = sample size of Group A
n2 = sample size of Group B
σ 1 = standard deviation of Group 1
σ 2 = standard deviation of Group 2
Δ = difference in group means
κ = ratio = n2/n1
Z1-α/2 = two-sided Z value
Z1-β = power

The mean values of the synkinesis were taken as 48.4±12.54 and 27.84±8.321 respectively[14] and calculations were done with a 95% confidence level and 80% power of the study. The sample size of 30 (in each group) was inflated to cover 20% of dropouts. The sample was raised using a non-probability purposive sampling technique from among Bell's palsy patients diagnosed by neurology physicians.

Those included were patients of either gender aged 25-50 years having sub-acute (weeks 4-9 post-onset) or chronic (10 weeks post-onset) unilateral Bell's palsy of non-congenital origin.[7,15-17] Patients with traumatic facial palsy, other neurological disorders, surgical reconstructions of nerve or muscle, psychiatric disorders, skin conditions, and contraindications for massage were excluded.[7]

After obtaining informed consent from all the participants, they were randomly divided into two groups using computer-generated random numbers. A bowl of sealed opaque envelopes with treatment groups A or B was presented to the participants, and during the selection of the envelope, the treatment was given accordingly. Two physical therapists provided the treatment with an average experience of three years in dealing with neurological conditions having command of MT and KR.

Group A received KR with routine physical therapy (RPT), including nerve stimulation, focussing on specific exercises targetting various facial muscles and resistance movements. Active participation in KR interventions involved specific facial exercises, like smiling without opening the mouth, warbling lips, lifting corners of the mouth, lowering lips, opening the mouth, tilting the head up, extending the tongue up, and trying to touch the tip. In all these movements, resistance was used for 5 seconds.[16] Group B underwent MT with RPT, including nerve stimulation. It involved facial massages, stretching exercises and activities to reduce synkinesis.

Both groups participated in exercises utilising mirrors and specific facial movements. A home plan was also recommended, encouraging the participants to perform daily facial exercises. A total of three sessions were given in a week on an alternate basis for up to six weeks in each group. The time for each session was 30 minutes.

Outcomes were measured using the Facial Disability Index (FDI) and the House-Brackmann Facial Nerve Grading Scale (HBGS). The FDI assessed the participants' physical and social features, providing a comprehensive evaluation of their disability and well-being. It contains 10 questions, the five focus on physical health while the remaining five measure social function and well-being. The score ranged from 0 to 100 with "0" indicating the worst and 100 being the best.[18] The HBGS examined synkinesis, and general facial movements, categorising facial paralysis on a scale from normal to complete paralysis.[19] The score of synkinesis is from 0-3 (no synkinesis to severe synkinesis) and the movements of the forehead, eye, nose, and mouth ranged from 1-6 (normal to no movement). The score is combined to give the final grade of HBGS from the I to VI (4-24 scores) grading system. Each HBGS grade corresponds to an estimated percentage of facial nerve function, with Grade I representing near-normal function (close to 100%) and Grade VI representing minimal or no function (0-19%).[20,21]

The measurement of synkinesis and facial muscle function was done by a neurologist, that was blinded to the treatment group. The assessment was made at the baseline

and the third and sixth weeks of intervention.

Data was analysed using SPSS 25. Numerical data was presented as mean±standard deviation (SD), while categorical data was presented as frequencies and percentages. Data normality was assessed using the Kolmogorov-Smirnov test. Facial impairment and synkinesis were compared between the groups using the Mann-Whitney U test. The intragroup difference was assessed using Friedman's analysis of variance (ANOVA) test. Missing data was managed using the intention-to-treat analysis based on the last observation carrying forward (LOCF) technique. P<0.05 was taken as significant.

Results

Of the 72 patients, 41(56.9%) were females and 31(43.1%) were males. The overall mean age was 37.77±6.98 years, mean body mass index (BMI) was 25.71±5.71kg/m^2 and 41(56.9%) patients had left-sided palsy (Table 1).

Table-1: Demographic and clinical characteristics.

Variables	GROUP A (Kabat Rehabilitation)	GROUP B (Mime Therapy)	*p*-value
Mean Age (years)	36.02±6.69	39.52±6.64	0.014*1
Height (m)	5.47±0.34	5.46±0.36	0.799*1
Weight (Kg)	68.47±11.03	69.30±10.36	0.757*1
Body mass index (BMI) (Kg/m^2)	24.96±5.78	26.46 ± 5.61	0.266*1
Gender			
Male	41.7%	44.4%	0.016*2
Female	58.3%	55.6%	0.17*2
Affected Side			
Right	61.1%	25%	<0.001*2
Left	38.9%	75%	<0.001*2

*1 P-value was calculated using Mann Whitney U Test, *2 P-value was calculated using the Chi-Square Test.

Table-2: Intergroup analysis of synkinesis and facial disability.

Variable	Group	Baseline		3rd Week		6th Week	
		Median (IQR)	p-value	Median (IQR)	p-value	Median (IQR)	p-value
Synkinesis	GroupA	22.00 (6.50)	0.968	38.00 (9.00)	<0.001	54.00 (3.00)	<0.001
	Group B	22.00 (8.00)		26.00 (5.75)		40.00 (7.50)	
Facial Disability	Group A	21.50 (6.50)	0.928	48.00 (5.75)	<0.001	76.00(7.00)	<0.001
	Group B	22.00 (4.75)		32.00 (4.00)		54.50 (3.75)	

Table-3: Intragroup analysis of synkinesis and facial disability.

Outcome Variables	Assessment Time	Study Groups: Group A (Kabat Rehabilitation)	Group B (Mime Therapy)
Synkinesis	Baseline	21.33±5.00	21.02±5.49
	At 3rd Week	37.47±6.38	26.08±5.17
	At 6th Week	53.00±2.49	40.36±5.94
Chi-square & *p*-value	72.00, $p<0.001$	71.51, $p<0.001$	
Facial Disability	Baseline	22.00±3.72	21.94±3.44
	At 3rd Week	46.38±5.41	31.63±4.09
	At 6th Week	75.36±6.67	54.00±2.44
Chi-square & *p*-value	72.00, $p<0.001$	71.51, $p<0.001$	

Facial disability and synkinesis were significantly different in both groups post-intervention ($p<0.001$), while intergroup differences were significant in the 3rd and 6th weeks ($p<0.001$) (Tables 2-3).

Discussion

The current study evaluated the comparative effects of KR rehabilitation versus MT on individuals with Bell's palsy. The findings indicated a significant improvement in the degree of synkinesis and facial disability in both groups, while there was a significant increase in both outcomes in the KR group compared to the MT group.

Adhikari et al. assessed the initial and eventual recovery of KR combined with facial expressive and functional exercises (FEFE) in Bell's palsy, and the findings showed improvement in rating from 12/100 to 68/100, thus the KR contributed to a contralateral contraction and facilitation of the weakened muscles, which can be achieved by resistance, irradiation, reciprocal inhibition and stretch that facilitated muscle contraction by a movement pattern using multisensory inputs.[22]

Giacalone et al.[23] demonstrated that the use of KR for Bell's palsy consisted of principal techniques, such as manual contact, stretching, resistance and verbal command. The present study found that KR application utilising traction as well as pressure on the face facilitated both proprioceptive and somatic sensitivity. The patients were asked to hold onto or contract the muscles, which caused re-stimulation of the involved muscles, as KR is made up of the principal methods together with manual contact, stretching resistance and verbal command.

Khanzada et al. compared the impact of KR and facial muscle exercises in conjunction with nerve stimulation in Bell's palsy patients and discovered that following 3 weeks of therapy, the KR group demonstrated greater improvement in synkinesis, with a mean post-treatment score of 81.58 compared to the facial exercises group which had a mean post-treatment score of 63.77. Monini et al.[1] and Barbara et al.[24] indicated that in the early phases of Bell's palsy, the KR was shown to give better and faster healing, specifically in severe cases, because of its influence in preventing any additional complications, such as synkinesis.

Sumathi et al. looked into the impact of facial nerve

electrical stimulation with KR and facial exercises in Bell's palsy and compared them with a control group that was given electrical stimulation and facial exercises for just two weeks. The findings were in agreement with the current findings.[25] Ghous et al. found that KR was more effective than tape at reducing facial impairment and synkinesis.[14] Additionally, research found that PNF approaches reduced facial impairment and synkinesis.[26]

Qamar et al. subjected one group to KR with electrical stimulation and Kinesio taping, and the other group to electrical stimulation in addition to home exercises for Bell's palsy individuals. The results showed improvements in both groups, but the KR group demonstrated a significantly increasing effect on facial asymmetry, as the KR improved circulation and both the gross and precise activation of facial muscles.[5] The current study did not compare kinesio-taping and applied both KR and nerve stimulation in the same group.

MT has been proven to improve face symmetry and functionality.[7,27] It has been compared to other therapies, such as the motor imagery method, to examine its influence on facial expressions in patients with facial palsy.[28] While MT has demonstrated potential, it is crucial to note that there are different points of view within the academic community on the matter. The improvement in the current study's group B participants, who received MT, could be attributed to the fact that MT included massage of the face, stretching and mime exercises based on expressions, such as happy, sad, angry, surprise, and so on. All of these are components of a person's everyday life in terms of facial activities.

Exercises like these aid in face rehabilitation by reducing aberrant patterns of movement and re-establishing symmetrical muscle activity control for targeted facial activities.[27] A few investigations showed that mime treatment lowered facial asymmetry when at rest and during voluntary movements, hence, lowering synkinesis. Additionally, mime exercises are connected to emotional regulation, which is linked to the activation of the thalamus, globus pallidus and reticular system. When these activities are performed, they engage the reticular system, which improves muscular control and thereby reduces synkinesis.[29] When performing these facial exercises, there is a continuous rise in muscular tension followed by bilateral relaxation, which enhances facial circulation[30] as well as coordination between the two halves of the face, allowing them to exhibit facial movements and emotions symmetrically.[31] However, the methodological quality of these studies needs to be assessed further.

The current study has its limitations as it did not explore the treatment's possible long-term effects. Besides, the use of self-reported outcome measures may have introduced the potential for bias. Further longer-term studies are needed with a variety of outcome assessment tools to validate the current findings.

Conclusion

KR interventions led to more significant improvements in synkinesis and facial disability compared to MT.

Acknowledgement: We are grateful to all those who facilitated the study, especially hospital staff and colleagues.

Disclaimer: The text is based on an academic thesis.

Conflict of Interest: None.

Source of Funding: None.

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Author Contribution:

AA: Concept, data collection, analysis and drafting.

AJ: Design, data analysis, interpretation, drafting and revision.

NF: Data collection, analysis and revision.

HBJ, HZ: Data collection, drafting and revision.