Majalah Ilmiah Fisioterapi Indonesia
Indonesian Scientific Journal of Physiotherapy

Case Reports / Case Studies
ISSN (Print): 2303-1921
ISSN (Online): 2722-0443
Volume 14, Number 2, Pages 652-656 (2026)
DOI: https://doi.org/10.24843/mifi.000002079

Integrated Infrared, Electrical Stimulation, and Mirror Therapy in Bell's Palsy Rehabilitation: A Case Report

Aisyah Bintang Syahirah[1], Dimas Arya Nugraha[2], Nurma Auliya Hamidah[3]

[1,3]Diploma Program in Physiotherapy, Faculty of Health Sciences, Universitas Muhammadiyah Lamongan, Lamongan, East Java, Indonesia
[2]Department of Physiotherapy, Faculty of Health Sciences, Universitas Muhammadiyah Lamongan, Lamongan, East Java, Indonesia

Corresponding author:
Name: Dimas Arya Nugraha
E-mail: dimasaryanugraha@umla.ac.id

Received 20 July 2025; Revised 25 August 2025; Accepted 27 August 2025; Published 31 May 2026

Abstract

Background: Bell's palsy is an acute unilateral facial nerve paralysis that causes facial muscle weakness, impaired facial expressions, difficulty closing the eyes, and psychosocial limitations. Physiotherapy interventions are commonly used to facilitate functional recovery; however, evidence regarding integrated multimodal approaches remains limited.
Objective: To describe the effectiveness of a multimodal physiotherapy program consisting of infrared therapy, electrical stimulation, and mirror exercise in improving facial function in a patient with Bell's palsy.
Methods: This case report involved a 52-year-old male diagnosed with Bell's palsy presenting with facial asymmetry, incomplete eye closure, and cheek muscle weakness. The patient underwent a four-week physiotherapy program combining infrared therapy, electrical stimulation, and mirror exercise. Outcomes were evaluated periodically using the UGO Fisch classification, Manual Muscle Testing (MMT), and the Facial Disability Index (FDI). Descriptive analysis was used to compare pre- and post-intervention outcomes.
Results: Following four weeks of intervention, facial function showed substantial improvement. The UGO Fisch grade improved from V to III, indicating better facial nerve function. Muscle strength increased from MMT grade 1 to grade 3, while the FDI score improved from 52 to 80, representing a 53.8% increase in functional status. Improvements were also observed in facial symmetry, eye closure, self-confidence, and social participation.
Conclusion: The combination of infrared therapy, electrical stimulation, and mirror exercise was associated with improved muscle strength, facial function, and quality of life in a patient with Bell's palsy. These findings suggest that multimodal physiotherapy may be an effective rehabilitation strategy to support functional recovery and enhance patient outcomes.

Keywords
Bell Palsy; Physical Therapy Modalities; Electric Stimulation Therapy; Infrared Rays; Mirror Therapy; Facial Muscles

Introduction

The human face plays a vital role in identity, emotional expression, and social communication. Disorders affecting the face, whether aesthetic or functional, may lead to significant psychological and social distress.[1] One of the neurological disorders with a direct impact on facial muscle function is Bell's palsy, an acute, unilateral paralysis of the facial nerve (cranial nerve VII). Common clinical features include facial muscle weakness, post-auricular pain, altered taste, sensory changes in the face, and hyperacusis.[2] The annual incidence is approximately 23 cases per 100,000 population in the United States and 20 per 100,000 in the United Kingdom.[3] In Indonesia, Bell's palsy accounts for 40–70% of all acute peripheral facial nerve palsies, with an annual prevalence of 10–30 cases per 100,000 population.[4] At Ngimbang General Hospital, 2–3 new cases are recorded per month out of an estimated 60 peripheral nerve dysfunction cases.

Bell's palsy is characterized by acute, idiopathic peripheral facial paralysis that affects the entire facial musculature. The facial nerve also carries parasympathetic fibers controlling the lacrimal and salivary glands, as well as limited sensory fibers responsible for anterior tongue taste sensation.[5] Although most cases are idiopathic, viral infections such as herpes simplex, varicella-zoster, and Epstein–Barr virus have been implicated. It may also occur secondary to Ramsay Hunt syndrome, Lyme disease, trauma, tumors, congenital anomalies, or autoimmune conditions.[6]

Physiotherapy plays a crucial role in the management of Bell's palsy, aiming to accelerate recovery of facial muscle function. Infrared therapy improves local blood flow and promotes tissue healing, thereby supporting muscular function.[7] Electrical stimulation applies transcutaneous electrical currents to stimulate nerves or muscle tissue, eliciting contractions.[8] Mirror exercise is a training-based intervention that utilizes visual feedback through a mirror to enhance motor control.[9]

This case is significant as it demonstrates the integrated use of three physiotherapy modalities infrared therapy, electrical stimulation, and mirror exercise—which remains rarely reported in both local and international literature. Furthermore, there is a notable research gap, as case reports on multimodal physiotherapy for Bell's palsy remain limited, particularly in Indonesia. Another strength of this report is the use of comprehensive quantitative outcome measures, including the UGO Fisch classification, Manual Muscle Testing (MMT), and the Facial Disability Index (FDI), which are seldom presented together in similar studies.

The patient presented in this study was a 52-year-old male with facial asymmetry, incomplete eye closure, and weakness of the cheek muscles (MMT grade 1). He had no history of hypertension or diabetes but reported a mild upper respiratory tract infection two weeks before onset. There was no family history of neurological disorders. The patient had previously received pharmacological therapy with corticosteroids but had not undergone physiotherapy prior to this case. The aim of this study was to evaluate the effectiveness of combined infrared therapy, electrical stimulation, and mirror exercise in improving facial function in a patient with Bell's palsy.

Methods

This study is a descriptive case report conducted at the Department of Medical Rehabilitation, Ngimbang General Hospital, involving a 52-year-old male patient diagnosed with Bell's palsy. The diagnosis was confirmed by a neurologist based on clinical examination showing unilateral peripheral facial paralysis, with no history of head trauma or stroke, which served as exclusion criteria.

The patient presented with facial asymmetry, inability to blink, raise eyebrows, smile, or whistle. The initial objective assessment indicated UGO Fisch grade IV, average facial muscle strength of grade 1 on the right side according to Manual Muscle Testing (MMT), and a Facial Disability Index (FDI) score of 50%. He also reported limitations in facial expression and chewing function. The onset of symptoms occurred approximately three days before the initial examination. Prognostic factors included age above 50 years, moderate-to-severe initial paralysis, and initiation of therapy within the first week of onset. [10]

Three validated instruments were used in this study: (1) the UGO Fisch scale to determine the severity of facial paralysis (grades I–VI, reliable for clinical evaluation); (2) MMT to assess facial muscle strength on a scale of 0–5; and (3) the FDI to subjectively evaluate facial functional disability. These instruments were selected because they are practical, valid, and commonly used in peripheral nerve rehabilitation.

The intervention was conducted over a four-week period in January 2025, comprising a total of four physiotherapy sessions. Treatment sessions were administered twice weekly, with each session lasting approximately 30–40 minutes. A multimodal physiotherapy approach was implemented, consisting of electrical stimulation, infrared therapy, and mirror exercise.

Electrical stimulation was applied using faradic current with a frequency of 30 Hz. The stimulation protocol included a contraction time of 3 seconds followed by a 10-second rest period, with the intensity adjusted according to the patient's tolerance until visible contractions of the facial muscles were elicited. The intervention was administered for approximately 15 minutes, targeting the frontalis, orbicularis oculi, and orbicularis oris muscles to facilitate muscle activation and improve neuromuscular function.

Infrared therapy was subsequently delivered for 15 minutes at a distance of approximately 30 cm from the treatment area. The temperature was maintained at a warm and comfortable level to promote local blood circulation, enhance tissue metabolism, and support the recovery process.

Mirror exercise was performed in front of a mirror to provide visual feedback and improve facial motor control. The exercise program included raising the eyebrows, closing the eyes, smiling, and blowing, with each movement repeated 10–15 times. To reinforce motor learning and encourage continuous practice, the patient was also instructed to perform these exercises independently at home as part of a home exercise program.

Weekly evaluations were conducted to monitor clinical progress. At week one, the patient remained at UGO Fisch grade IV, MMT grade 1, and FDI score of 50%. By week two, improvements were noted with UGO Fisch grade III, MMT grade 2, and FDI score of 60%. At week three, the patient achieved UGO Fisch grade II–III, MMT grade 3, and FDI score of 70%. By week four, further improvements were observed with UGO Fisch grade II, MMT grade 4, and FDI score of 80%.

Data were analyzed descriptively by comparing pre- and post-intervention outcomes using the UGO Fisch scale, MMT, and FDI. As this is a single case report, no statistical testing was performed. The study was conducted in accordance with the principles of the Declaration of Helsinki. Written informed consent was obtained from the patient for participation and publication of this case report.

Results

This study was conducted in January 2025 and involved Mr. S, a 52-year-old male patient diagnosed with Bell's palsy. The patient underwent a comprehensive physiotherapy program consisting of infrared therapy, electrical stimulation, and mirror exercise for four weeks. Treatment was provided twice weekly, resulting in a total of eight therapy sessions. Clinical evaluations were performed at four time points: baseline (T1), week 2 (T2), week 3 (T3), and week 4 (T4), to monitor changes in facial muscle strength and functional performance throughout the intervention period.

Electrical stimulation was administered to facilitate muscle activation and improve neuromuscular function. Electrodes were strategically positioned over the frontalis muscle to stimulate eyebrow elevation, the orbicularis oculi muscle to facilitate eye closure, the zygomaticus major muscle to promote smiling, and the orbicularis oris muscle to improve lip puckering movements. This intervention aimed to enhance muscle contraction and support the recovery of facial motor function.

Infrared therapy was applied to the affected facial region to increase local blood circulation, improve tissue metabolism, and facilitate the healing process of the involved muscles and nerves. The warming effect of infrared radiation was intended to create favorable physiological conditions for tissue recovery and functional restoration.

Mirror exercise was incorporated as a motor retraining strategy using visual feedback. The patient performed a series of facial movements while observing the reflection in a mirror, including raising the eyebrows, furrowing the forehead, closing the eyes, moving the nostrils, smiling, and whistling. These exercises were designed to improve motor control, facial symmetry, and coordination by enhancing the patient's awareness of facial muscle activity and encouraging the relearning of normal movement patterns.

Overall, the interventions resulted in significant clinical improvements. By T4, all six monitored facial muscles reached MMT ≥3. The UGO Fisch score increased from 21 (grade V, severe paralysis) to 58 (grade III, moderate paralysis), and the FDI score improved from 52 to 80. Clinically, the patient was able to fully close his eyes, started to whistle, and demonstrated improved facial symmetry during smiling. The progression of facial muscle strength during the four-week intervention is summarized in Table 1. The table presents MMT scores for six key facial muscles (frontalis, corrugator supercilii, orbicularis oculi, nasalis, zygomaticus major, and orbicularis oris) at T1 (baseline), T2 (week 2), T3 (week 3), and T4 (week 4). The data demonstrate gradual improvements in muscle strength, particularly evident by week four.

Table 1. Manual Muscle Testing (MMT) Scores of Facial Muscles Across Four Weeks

Muscle	T1	T2	T3	T4
Frontalis	1	1	1	3
Corrugator supercilii	1	3	3	3
Orbicularis oculi	1	1	3	3
Nasalis	1	1	1	3
Zygomaticus major	1	1	1	3
Orbicularis oris	1	1	1	3

MMT scale: 0 = no contraction; 1 = palpable contraction; 2 = movement with gravity eliminated; 3 = movement against gravity; 4 = movement against moderate resistance; 5 = normal.

The table demonstrates progressive improvement in all evaluated facial muscles, particularly by week four. Table 2 presents the patient's functional outcomes as measured by the Facial Disability Index. Both the physical function and social/well-being subscales were assessed at four time points (T1–T4), showing a steady increase from baseline to the end of therapy, reflecting enhanced facial function and social participation.

Table 2. Facial Disability Index (FDI) Scores Across Four Weeks

Subscale	T1	T2	T3	T4
Physical Function (0–100)	52	52	72	80
Social/Well-being (0–100)	52	52	72	80

Both subscales showed notable improvement, increasing from 52 at baseline to 80 at the end of therapy. The patient's facial movement abilities were assessed using the UGO Fisch Scale, as shown in Table 3. Scores for specific tasks including rest, forehead wrinkling, eye closure, smiling, and whistling were recorded at T1–T4. The total score indicates improvement from severe to moderate paralysis, illustrating functional recovery over the course of the intervention.

Table 3. UGO Fisch Scale Scores Across Four Weeks

Task	T1	T2	T3	T4
Rest	0	0	0	6
Forehead wrinkling	3	7	7	7
Eye closure	9	9	21	21
Smiling	9	9	9	21
Whistling	0	0	0	3
Total	21	25	37	58

UGO Fisch score range: 0–100.

The patient's total score increased from 21 (grade V, severe paralysis) to 58 (grade III, moderate paralysis). Table 4 summarizes the sensory evaluation of key facial muscles, including frontalis, orbicularis oculi, zygomaticus major, and orbicularis oris, across four time points (T1–T4). Sensory function remained within normal limits throughout the intervention, indicating that the therapy did not adversely affect facial sensation.

Table 4. Sensory Assessment of Facial Muscles Across Four Weeks

Key Muscle	T1	T2	T3	T4
Frontalis	3	3	3	3
Orbicularis oculi	3	3	3	3
Zygomaticus major	3	3	3	3
Orbicularis oris	3	3	3	3

Scale 0–3: 0 = anesthesia; 1 = severe hypesthesia; 2 = mild hypesthesia; 3 = normal.
Sensory function remained normal throughout therapy.

No adverse effects were reported from infrared therapy, electrical stimulation, or mirror exercise. The patient adhered to prescribed home exercises, which supported the therapy's effectiveness. Follow-up two weeks after therapy completion showed sustained improvement without symptom regression. No additional medical interventions were provided during the study period, suggesting that the observed improvements were likely attributable to the multimodal physiotherapy program.

Discussion

The findings of this case report indicate that a physiotherapy intervention combining infrared therapy, electrical stimulation, and mirror exercise positively influenced facial function recovery in a patient with Bell's palsy. As presented in Table 1, significant improvements in facial muscle strength were observed in several muscles, including the corrugator supercilii, orbicularis oculi, frontalis, nasalis, zygomaticus major, and orbicularis oris, after four weeks of therapy. These results are consistent with previous studies reporting that electrical stimulation effectively enhances muscle strength and facial function in Bell's palsy cases. [11,12] (superscript) Electrical stimulation induces muscle contractions by delivering electrical currents through the skin, thereby activating motor nerves and weakened muscle tissue.[13]

Furthermore, the improvements shown in Tables 2 and 3 highlight functional recovery. Infrared therapy contributes by promoting blood flow through vasodilation and increasing collagen tissue flexibility. These effects facilitate tissue metabolism, reduce pain, and accelerate muscle regeneration, ultimately enhancing facial functional capacity. [14] Thus, infrared therapy not only serves as a supportive modality but also amplifies treatment outcomes by improving oxygen and nutrient delivery to paralyzed muscle tissue.

Mirror exercise demonstrated a crucial role in restoring facial expression. This intervention leverages visual feedback when the patient observes the reflection of the healthy side of the face in a mirror, activating mirror neurons in the premotor and inferior parietal cortex. Such activation promotes neuroplasticity, enabling the reorganization of neural circuits in the paralyzed side. Mirror exercise effectively improves motor coordination and facial expression in patients with peripheral neurological impairments, facilitating the recovery of motor control and enhancing facial symmetry.[15]

Patient adherence and family support were also key contributors to treatment success. Active participation in home exercises and family encouragement accelerated recovery, emphasizing that physiotherapy for Bell's palsy should adopt a holistic approach that integrates psychosocial factors in addition to clinical procedures. This case report has several limitations. First, it involves a single patient, limiting generalizability. Second, long-term follow-up was not conducted, leaving the sustainability of outcomes uncertain. Third, there was no control group, making it difficult to attribute improvements solely to the intervention rather than natural recovery. Fourth, the assessment instruments MMT, FDI, and UGO Fisch were partially subjective, without additional objective measures such as electromyography.

It should also be noted that many cases of Bell's palsy undergo spontaneous recovery within 3–6 months. However, the increase in UGO Fisch score from 21 to 58 over four weeks, corresponding to clinical improvement from grade V to grade III, indicates the patient regained full eye closure, whistling ability, and a more symmetrical smile. This suggests that the multimodal therapy contributed to accelerated recovery beyond the natural disease course.

Compared to previous research, the increase in MMT from 1 to 3 in most facial muscles over four weeks aligns with findings by Widya & Wahyu who reported enhanced muscle strength following intensive electrical stimulation.[12] However, the magnitude of

FDI improvement from 52 to 80 in this case was higher than in several previous case reports. Recent systematic reviews have also indicated that combining physiotherapy modalities is more effective in improving facial symmetry than single-modality interventions (e.g., meta-analyses 2022–2023 on Bell's palsy rehabilitation).

The practical implication of this report is that a combination of simple modalities infrared therapy, electrical stimulation, and mirror exercise—can be implemented in primary care or regional hospitals with limited resources, providing meaningful clinical benefits. Theoretically, this case supports the role of neuroplasticity in peripheral neurological rehabilitation and expands understanding of the efficacy of multimodal approaches during the subacute phase of Bell's palsy.

In summary, the key lesson from this case is that a multimodal physiotherapy approach, coupled with patient education and family support, can accelerate facial function recovery in Bell's palsy. This strategy represents a clinically applicable, safe, and replicable intervention across various healthcare settings.

Conclusion

A 52-year-old male patient with Bell's palsy who underwent a physiotherapy intervention combining infrared therapy, electrical stimulation, and mirror exercise demonstrated marked improvements in facial muscle strength and functional performance. These gains were objectively assessed using Manual Muscle Testing, the Facial Disability Index, and the UGO Fisch Scale, all of which showed consistent enhancement by the end of the intervention.

In addition to the clinical intervention, active participation in home exercises and strong family support significantly contributed to treatment success, highlighting the importance of psychosocial factors in augmenting the effectiveness of physiotherapy interventions.

The findings suggest that a combination of infrared therapy, electrical stimulation, and mirror exercise represents a practical and applicable rehabilitation strategy for Bell's palsy, particularly in accelerating facial function recovery. However, given that this report is based on a single case, further studies with larger sample sizes and more robust research designs are needed to confirm long-term efficacy and generalizability.

Overall, this case report not only reinforces the benefits of a multimodal physiotherapy approach previously documented in the literature but also emphasizes its practical applicability in clinical practice. The novelty of this study lies in highlighting the synergistic effect of combining three physiotherapy modalities, alongside patient engagement and family support, as key factors in promoting faster recovery from Bell's palsy.

Author Contributions

Aisyah Bintang Syahirah: Conceptualization, Investigation, Data Curation, Formal Analysis, Writing – Original Draft Preparation.
Dimas Arya Nugraha: Supervision, Methodology, Validation, Writing – Review and Editing, Project Administration.
Nurma Auliya Hamidah: Data Curation, Resources, Investigation, Writing – Review and Editing.

Acknowledgments

The authors would like to express their sincere gratitude to the Department of Medical Rehabilitation of Ngimbang General Hospital for facilitating this study. Appreciation is also extended to the patient and family for their participation, cooperation, and consent for publication of this case report.

Conflict of Interest Statement

The authors declare that there are no conflicts of interest related to this study.

Funding Sources

This study received no specific grant from any funding agency in the public, commercial, or not-for-profit sectors.

Ethics Statement

This case report was conducted in accordance with the principles of the Declaration of Helsinki. Written informed consent was obtained from the patient for participation and publication of clinical information. Institutional ethical approval was not required for a single-patient case report according to local regulations; however, all efforts were made to ensure confidentiality and anonymity of patient data.

References

1. Maity MK, Naagar M. A review on headache: epidemiology, pathophysiology, classifications, diagnosis, clinical management and treatment modalities. Int J Sci Res. 2022;11(7):506-15.
2. Eviston TJ, Croxson GR, Kennedy PGE, Hadlock T, Krishnan AV. Bell's palsy: aetiology, clinical features and multidisciplinary care. J Neurol Neurosurg Psychiatry. 2015;86(12):1356-61.
3. Piercy J. Bell's palsy service. [Place unknown]: [Publisher unknown]; 2005. p. 1-3.
4. Sofiaputri A, Prafitri LD. Gambaran peningkatan fungsional pasien Bell's palsy setelah pemberian kombinasi transcutaneous electrical nerve stimulation (TENS) dan exercise: literature review. Pros Semin Nas Kesehat. 2021;1:1243-9.
5. Oliveira C, Sousa R, Ramos C, Cruz AL. Effect of electrostimulation applied on Bell's palsy—a systematic review. OALib. 2022;9(6):1-14.
6. Spencer CR, Irving RM. Causes and management of facial nerve palsy. Clin Otolaryngol. 2016;41(6):759-69.
7. Oktaviani F, Sabtorini A, Setyara SHA, Putri RS, Farizqi KL, Setyaningsih I, et al. Penatalaksanaan fisioterapi pada kasus Bell's palsy sinistra et causa diabetes melitus dengan kombinasi modalitas electrical stimulation facialis dan mirror exercise. Safari J Pengabd Masy Indones. 2024;4(1):245-52.
8. Azman MF, Azman AW. The effect of electrical stimulation in improving muscle tone. IOP Conf Ser Mater Sci Eng. 2017;260:012020.
9. Yang YR, Chen YH, Chang HC, Chan RC, Wei SH, Wang RY. Effects of interactive visual feedback training on post-stroke pusher syndrome: a pilot randomized controlled study. Clin Rehabil. 2015;29(10):987-93.
10. Loyo M, McReynold M, Mace JC, Cameron M. Protocol for randomized controlled trial of electric stimulation with high-volt twin peak versus placebo for facial functional recovery from acute Bell's palsy in patients with poor prognostic factors. J Rehabil Assist Technol Eng. 2020;7:2055668320964143.
11. Amalia H, Widodo A, Fauzan M. Penatalaksanaan fisioterapi pada kasus Bell's palsy. J Anestesi. 2024;2(2):42-8.

12. Widya A, Wahyu ST. Physiotherapy management in Bell's palsy case with electrical stimulation and massage modalities: a case report. Acad Physiother Conf J. 2021;:403-12.
13. Nugraha, dkk. Metode Bobath dan electrical stimulation dapat meningkatkan kekuatan otot pada pasien stroke: studi kasus. J Holist Care. 2022;3(3):1-4.
14. Astuti SW, Rahman I. Penatalaksanaan fisioterapi pada Bell's palsy dengan modalitas infrared, electrical stimulation dan mirror exercise di RS Pindad Kota Bandung. J Stikes Sitihajar. 2021;3:132-7.Mughal S, Shoukat F, Munawar A, Tahir R. Effectiveness of facial neuromuscular retraining with and without mirror visual feedback in patients with Bell's palsy. Arch Anesthesiol Crit Care. 2018;4(4):527-34.