



Case report

Effectiveness of facial palsy protocol among patient with mucormycosis following COVID-19: A case study

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ABSTRACT

A 41-year-old male with a history of diabetes mellitus presented with right facial palsy post COVID-19 Associated Mucormycosis. A 4-week physiotherapeutic intervention; ice therapy, Mime therapy, Facial Soft Tissue Manipulation, and Facial Proprioceptive Neuromuscular Stimulation, showed improvement in the symptoms of patient and scores of House- Brackman Facial Grading Scale.

Introduction

Mucormycosis, a fatal fungal infection, is not uncommon in India before 2019 with prevalence of 140 cases per million people [1]. There was an unexpected rise in cases of the COVID-19 Associated Mucormycosis (CAM) during the second wave of COVID-19 pandemic. The most emerged variety of Mucormycosis during the pandemic was COVID-19 associated rhino-orbital-cerebral Mucormycosis (CAROCM) [2]. Globally, the prevalence of CAM ranged from 0.005 to 1.7 per million people with India having the highest prevalence of approximately 80 times greater (0.14 per 1000) than other countries. Mucormycosis primarily affects immune-compromised individuals, such as patients with diabetes mellitus, hematologic malignancies, or organ transplantation and recently found to follow COVID-19 infection, mainly affecting the diabetic population [3]. India has already been declared as the diabetes capital of the world as it has the world's second-largest diabetes population, thereby having more cases of CAM in individuals with diabetes mellitus [4].

The exact course of Mucormycosis transmission is unknown, but it thought to begin in the nasal mucosa and proceed to the ethmoid and maxillary sinuses, orbits, and cerebral fossa [3]. Fever, headache, a reddish swollen skin over the nose and around the eyes are symptoms of Mucormycosis [5]. Multiple cranial nerve palsies are also associated with Mucormycosis. Paralysis of facial nerve is common in patients with rhino-orbital-cerebral Mucormycosis, accounting for 11% of cases. Facial palsy has an adverse impact on the quality of life (QOL) and emotional well-being [4].

There are established physiotherapy management for facial palsy [5,6] but there is lack of evidence that how these pre-existing

Abbreviations: COVID-19 associated Mucormycosis, (CAM); COVID -19 associated rhino-orbital-cerebral Mucormycosis, (CAROCM); Quality of Life, (QOL).

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accepted physiotherapy treatment will work for facial palsy due to CAM.

Therefore, the aim of the present study was to investigate the effectiveness of a newly developed physiotherapy protocol for the patient with facial palsy recovered from CAM.

Patient information

A 45-year-old male presented with the complaint of difficulty in the right eye closure, chewing from right side of mouth and swelling on the right side of face from the past 20 days prior his reporting to neurological physiotherapy OPD in July 2021.

The patient has a history of diabetes mellitus Type II from the past 15 years. In April 2021, he was tested positive for COVID-19 and recovered completely from it within 4 weeks. After a few days of recovery, he was having symptoms of facial palsy and was diagnosed with COVID -19 associated Mucormycosis in June 2021.

In April 2021, the patient tested positive for COVID-19, but at the time of reporting to OPD (i.e. in July 2021), his Real-Time Reverse Transcription-Polymerase Chain Reaction (RT-PCR) test was reported as negative.

Patient was on antifungal medications for COVID-19 associated mucormycosis, Amphotericin B (AMB), Posaconazole, or Isavuconazole with a dose of 5 mg/Kg/day intravenously.

Clinical findings

On observation, the patient was having facial asymmetry, swelling over the right parotid and maxillary region of the face, absent nasolabial fold, drooping of the right angle of the mouth (Fig. 1a), incomplete right eye closure (Fig. 2a) and an affected smiling on right side of face (Fig. 3a).

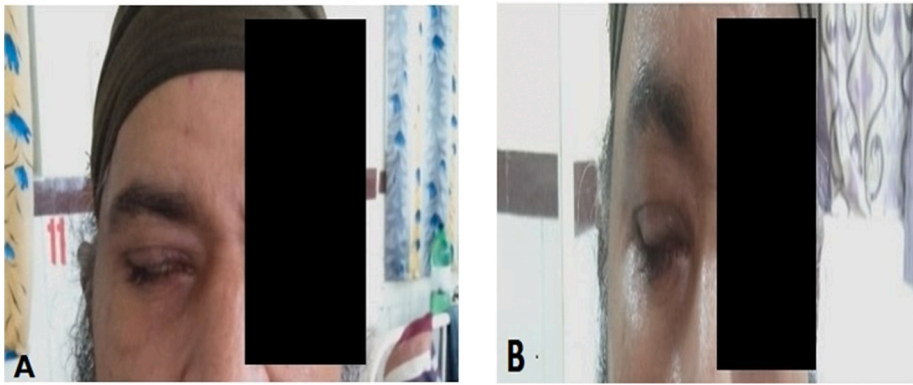
On examination, the superficial and deep sensations of the face were intact on right as well as left side. All the facial expressions of the right side were affected. The cranial nerve examination revealed that the motor division of the seventh cranial nerve was affected. **TIMELINE.**

The Event	Timeline
Suffering from Diabetes mellitus	Since last 15 years (from 2006)
Tested Positive for COVID-19	April 2021
Recovered from COVID-19	May 2021
Suffered from COVID-19 Associated Mucormycosis	June 2021
Symptoms of Facial Palsy	June 2021
Pre-assessment	July 2021
Physiotherapy treatment	July 2021 to August 2021
Post Assessment	August 2021



(A): Facial symmetry and swelling pre-intervention; (B): facial symmetry and swelling post-intervention

Fig. 1. Facial symmetry and swelling.



(A): Eye closure pre-intervention; (B): eye closure post-intervention

Fig. 2. Eye closure.



(A): Smiling expression pre-intervention; (B): smiling expression post-intervention

Fig. 3. Smiling expression.

Diagnostic assessment

Differential diagnosis of facial palsy has been done as per previous literature which include Bell's palsy; Upper Motor Neuron Lesions like Stroke, Subdural hematoma or brain tumour; Lower Limb Neuron Lesions like acute otitis media, cholesteatoma, viral infection, parotid malignancy, and traumatic injury [7].

The patient was assessed using outcome measure, House- Brackman Facial Grading Scale. The House-Brackman Scale is used to grade the severity of facial paralysis by grading facial functions in six grades from Normal (Grade 1) to Total paralysis (Grade 6). This scale was found to have strong inter-rater reliability (Kappa = 0.503–0.302) [8]. The outward movement of the mouth and the upward movement of the eyebrow of a patient with facial paralysis are used to calculate the House-Brackmann score. For both brow and lip motion, one point is given for every 0.25 cm of movement, up to a maximum of 1 cm. The results are then combined to provide a House-Brackmann score.

When a patient with facial paralysis receives an 8 (maximum score) on the House-Brackmann scale, their mouth and eyebrow move 1 cm. The non-paralyzed side of a patient's face is used to classify all patients based on brow and mouth movement.

There are no financial or cultural constraints to the patient to access for the assessment or the intervention.

Therapeutic intervention

The ethical approval of the study was obtained from an Institutional Ethical Committee of a tertiary care teaching hospital with registration number MMDU/IEC-2164. After obtaining written consent from the patient for his participation in the study and sharing his details for publication, physiotherapy intervention of 6 days a week for 4 weeks was given while following COVID-19 guidelines.

The pre intervention scoring of House- Brackman Facial Grading Scale was Grade V with absent outward movement of the mouth and upward movement of the eyebrow (i.e. the score was 0) as shown in Table 1.

On day 1 and 2

Ice therapy

To reduce swelling, ice pack was given over the parotid and maxillary regions for 10 minutes with continuous inspection of skin [5].

Mime Therapy

For facial motor reeducation Mime Therapy was introduced in which patient was instructed to sit relaxed and try to perform below given facial exercises in front of a mirror with 10–15 repetitions of each exercises [9]. The exercises were as follows:

- Raising both eyebrows (like a surprised face)
- Pulling both eyebrows downwards and inwards (an anger expression)
- Raising the outer edge of both nostrils forming diagonal lines on the bridge of the nose (like a disgusted expression)
- Closing both eyes tightly
- Smiling with and without showing teeth
- Bilaterally puffing the mouth
- Pursing of lips (like whistling)

Breathing exercises

As the patient had recovered from COVID – 19, he was taught pursed lip breathing and diaphragmatic breathing exercises with 5 repetitions of each.

For the pursed lip breathing, the patient was instructed to breathe in slowly and deeply through the nose and then exhale gently through pursed lips using instructions: blow on the candle flame, without dousing it and avoid forceful expiration and inspiration and for diaphragmatic breathing, the patient was instructed to sit comfortably, with knees bent and head, neck and shoulders in relaxed position. Place one hand on the upper chest and the other just below the rib cage and feel the movement of the diaphragm while breathing with instructions: slowly breathe in through the nose and feel the stomach moving out against the hand placed below the rib cage and slowly breathe out through pursed lips [10].

On day 3–7

Facial soft tissue manipulation

With the application of talcum powder, manipulation of facial soft tissue using fingertips or thumb kneading, wringing, and skin-rolling of the right side of the face was performed for the purpose of fluid drainage, regaining the ability to perform facial expressions, reduce muscle weakness and to increase muscle movements.

In finger or thumb kneading, skin and subcutaneous tissues of the right side of the face were moved in a circular manner from the underlying skin. In wringing, facial muscles of the right side; frontalis, zygomaticus, buccinators, and masseter were compressed, squeezed, and pulled away from side to side using fingers. In skin-rolling, skin of the right side of the face was lifted and rolled between thumb and index finger. Each manipulation was performed 10–15 times in distal to proximal (towards the mastoid process) direction [5].

Facial proprioceptive neuromuscular stimulation (repeated stretch from the beginning of range) to elicit stretch reflex

Patient was taught the below mentioned procedure to follow while performing the exercises for 10 times with 5 seconds hold of each [6].

The exercises were:

Table 1
Pre and post intervention outcome measure.

Outcome measures	Pre-intervention grading	Post-intervention grading
House-Brackmann Facial Grading Scale	Grade V (Severe Dysfunction) Score = 0 • Absent outward movement of the mouth (Score 0) • Absent upward movement of the eyebrow (Score 0) Interpretation At rest: Patient had facial asymmetry with drooping of corner of mouth and absence of nasal labial fold. At motion: No movement of forehead, incomplete eye closure and no to slight movement of eyebrows with maximal effort, no movement of corner of mouth, facial synkinesis, contracture, and hemifacial spasm was absent.	Grade II (Mild dysfunction) Score = 7 • 0.75 cm outward movement of the mouth (Score 3) • 1 cm upward movement of the eyebrow (Score 4) Interpretation At rest: Normal symmetry of forehead, slight weakness was noticeable only on close inspection. At motion: Ability to close eye with minimal effort and slight asymmetry, able to raise his eyebrows to maximum, ability to move corners of mouth with maximal effort and slight asymmetry. No synkinesis, contracture, or hemifacial spasm.

- Pursing the lips as whistling
- Smile with closed lips
- Lift angle of the mouth of one side followed by other
- With erect head, open mouth as wide as possible

Following the demonstration of exercises, when the patient attempted to perform each exercise therapist applied quick stretch to facial muscles of right side; frontalis, zygomaticus, buccinator and masseter for facilitation of muscle fibres and resistance (for 5 seconds) to the muscles of left side for irradiation of the strength and power to the affected muscles [6].

Mime therapy

Mime therapy was continued with same parameters as mentioned for Day 1 and Day 2.

Follow-up and outcomes

The treatment protocol from day 3 to day 7 was followed and continued for four weeks.

The results of this study showed improvement in symptoms after 4 weeks of physiotherapy program. It was observed that the House Brackman Scale was reduced to Grade II with score 3 for the 0.75 cm outward movement of the mouth and scored 4 for the 1 cm upward movement of the eyebrow (Table 1). Swelling was absent, improved facial symmetry, the nasolabial fold of the right side was present, improved angle of mouth on the right side of the face (Fig. 1b), complete eye closure (Fig. 2b) and improved smiling expression was present (Fig. 3b).

The patient was completely adhere with the intervention throughout the treatment duration and no adverse event was reported during and after the physiotherapeutic intervention.

Discussion

Mucormycosis is the second most frequent fungal infection in individuals with diabetes mellitus, following *Candida albicans* infection. The patient of this study presented with swelling over the right side of the face and it has been established that in diabetic patients, pathology of the arteries can induce swelling and localized facial nerve ischemia, compromising the nerve's blood flow and resulting in facial nerve palsy [11].

Instead of having seventh cranial nerve palsy, the taste sensation of the patient was intact, this is in line with the existing literature stating that the chorda tympani are usually spared in facial nerve palsy, but the taste impression is altered because the lesion is located distal to the chorda tympani bifurcation, where the nerve enters the stylomastoid foramen, as opposed to cases of facial nerve palsy caused by a viral infection or other etiology, in which the entire facial nerve is implicated [4].

Since ages, physiotherapy has been a boon for the rehabilitation of facial palsy and gain extensive vogue as a second line of treatment after pharmacological therapy. In this study physiotherapy treatment including ice therapy, Mime therapy, facial proprioceptive neuromuscular facilitation, soft tissue manipulation, given for four weeks showed clinical improvement in the outcome measure and thereby the symptoms of the patient.

Existing literature showed that soft tissue manipulation or massage therapy has been used to increase circulation, reduce involuntary contraction and to improve lymphatic drainage [12]. In the present case, STM assists in reducing the swelling of the face by improving the lymphatic drainage along with the facilitation of the weekend muscles. Facial exercises done in front of mirror was proven to promote muscular symmetry by providing feedback thereby decreasing synkinesis [13]. Mime therapy or mirror therapy helps the patient to regain its normal functioning of face by establishing a conscious link between the use of specific muscles and facial emotion developing and hence Mime therapy diminishes the extent of paresis and improves face symmetry [14]. Facial Proprioceptive Neuromuscular Facilitation is used to normalise resting tone and to improve expressions by inhibiting synkinetic movements and proven to be effective with faster recovery rate [15]. It was evident that PNF is beneficial for perioral muscles to adjust to changes after treatment because it enhances facial function by triggering the voluntary effort through proprioceptive stimulation. PNF was effective in perfecting the mouth and submandibular area [16].

A traditional approach of taping has expanded widely for the treatment of facial palsy. Application of taping is supposed to lift the skin in order to create extra space between the dermis and the muscles to reduce the pressure on the pain receptors in order to reduce pain. It also improves blood and lymphatic circulation and allows facilitation by providing sensory feedback [17]. But it might result in itching on the skin and not comfortable for most of the patients. Then, electrical muscle stimulation either using faradaic current or medium frequency current, i.e., transcutaneous electrical nerve stimulation is used to restore functions of paralyzed or weak muscles and enhancing the recovery speed by maintaining the tone of facial muscles of affected side [18]. The present case was a recovered patient from COVID-19 and associated Mucormycosis was also evident, therefore, any kind electrical stimulation has been avoided as the patient was quite apprehensive for the same.

Hence, it could be stated that this is an effective and safe physiotherapy protocol to administer for the treatment of facial palsy after CAM.

Limitations of the study and Future Recommendations: Only limitation of the study was that non-clinical qualitative and quantitative measurement of facial movements has not been assessed. Hence, it was recommended to use measuring tape to evaluate the movements of face along with pixel measurement of the face images before and after the treatment. It was also recommended to append the protocol for an experimental study and can be compared to a control group. Also, as the study was a case report, caution

must be undertaken while generalising it for the patients.

The protocol developed was proved to be an effective physiotherapeutic approach to treat facial palsy following CAM. Therefore, this protocol can further be used for an experimental study.

Patient perspective

The patient of this study was briefly instructed about the given treatment and its effects on his presenting symptoms. He was quite satisfied with the treatment he received which was relatively evident with the adherence rate to the intervention.

Patient was voluntarily agreed to participate in the treatment plan and gave consent to share his information and photos for research purpose if needed.

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Data included in article/supp. material/referenced in article.

Declaration of interest's statement

The authors declare no competing interests.

Additional information

No additional information is available for this paper.

Conflict of interest

None to be declare.

Declaration of interest

This original work is done honestly, read and approved by all the above-mentioned authors.

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