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ORIGINAL STUDY

Facial nerve palsy: A usual clinical presentation in the post coronavirus disease patients with mucormycosis

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Abstract

Background: Mucormycosis emerges as a severe fungal infection in the post coronavirus disease (post-COVID) uncontrolled diabetic patients with a history of steroid therapy. Facial palsy coexists in these patients due to mucormycosis. We aim to study the prevalence of facial palsy in these critical patients.

Methods: We designed a retrospective cross-sectional study for 26 patients admitted to El-Gomhorea Teaching Hospital to assess the prevalence of facial palsy among this group.

Results: A total of 46.2% of diabetic post-COVID patients present with facial nerve paralysis. We observed the clinical significance of facial palsy among different age groups.

Conclusion: Facial nerve palsy has become a usual clinical presentation in the era of a post-COVID uncontrolled diabetic and immunocompromised cases. Any post-COVID diabetic or immunocompromised patient with facial palsy and orbital affection should be highly suspicious of affection with mucormycosis.

1. Introduction

Mucormycosis (acute invasive fungal rhinosinusitis) is a severe form of fungal infection that primarily affect any immunocompromised patient as uncontrolled diabetics, patients on chemotherapy, organ transplantation and long uses of corticosteroid.

Several forms of invasive fungal include rhino orbital cerebral, pulmonary, gastrointestinal, and disseminated form [1].

After the pandemic coronavirus disease 2019 (COVID-19), many diabetic patients received steroids for a long duration as a part of protocol therapy for COVID-19 during the first and second waves of Corona infection which predisposed for an immunocompromised state causing emerge of numerous cases infected with mucormycosis.

The main presentations of mucormycosis are fever, facial pain, swelling, and eye-led swelling [2]. By examination, the early sign is hypoesthesia (anesthesia) over the turbinate then blackish discoloration (eschar formation) of the mucosa of the lateral nasal wall mainly middle and inferior turbinate in 40% of patients [3]. With increased numbers of mucormycosis admitted to El-Gomhorea Teaching Hospital, many patients are presented with facial nerve palsy. This retrospective study aims to focus on the era of facial nerve palsy in the post-COVID immunocompromised patients with mucormycosis.

2. Patient and methods

Study design: this is a retrospective cross-section study during the admission period in May, 2021.

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We have been accepted by the ethical committee of the general organization of teaching hospitals and institutes. The patients are collected from El Gomhorea Teaching Hospital which being a tertiary referral center for the management of cases with mucormycosis in post-COVID patients.

Study populations: 26 post-COVID patients with mucormycosis who are admitted during the period of the research are enrolled in the study.

Study protocol: all patient's files and documents are assessed for evidence of mucormycosis with nasal endoscopy and computed tomography (CT) paranasal sinus. In our study, we assess the incidence of facial nerve palsy in patients with mucormycosis. Documentation of gender, age, smoking status, presence of diabetes, or long duration of steroid therapy are taken from patient's files.

2.1. Grading for the cases (clinical grading)

We observe that patients are presented with different clinical manifestations. The patients are classified according to their clinical presentation into:

Grade 1 (rhino orbital) mucormycosis: in this type, the disease mainly includes sinonasal mucosa and the orbit. Examination of the nasal mucosa by sinuscopy revealed pale mucosa with hypoesthesia or anesthesia of the ipsilateral side. This is considered the early stage of mucormycosis invasion (Fig. 1).

Grade 2 (rhino orbital palatal) mucormycosis: at this stage, the patients present with eschars formation mainly the turbinates of the nose, the orbit involvement, and palatal involvement either with blackish spots or complete sloughing of the hard palate (Fig. 2).



Fig. 1. Endoscopic view of Right nostril show pale nasal mucosa with decreased vascularity in grade (1) rhino orbital mucormycosis.

Grade 3 (rhino orbital cerebral) mucormycosis: with more progression of the disease, the fungal infection spreads intracranially which is determined by the clinical deterioration of the patients with radiological assessment mainly by MRI.

Grade 4 (rhino orbital cerebral with facial skin involvement) mucormycosis: this is considered the last stage where the infection starts to widely disseminate mainly to the middle third of the face and carries a poor prognosis (Fig. 3).

2.2. Inclusion criteria

- (a) Patients have clear evidence of COVID-19 with mucormycosis.
- (b) Adult age of both sexes.
- (c) All the patients with nasal endoscopic examination and CT PNS.

2.3. Exclusion criteria

- (a) Patients do not have confirmed evidence of COVID-19 or mucormycosis.
- (b) Pediatric populations.
- (c) Patients with incomplete data in their files.

2.4. Statistical methods

Data were coded and entered using the statistical package for the Social Sciences (SPSS) version 26 (IBM Corp., Armonk, NY, USA). Data were summarized using mean and standard deviation for quantitative variables and frequencies (number of cases) and relative frequencies (percentages) for categorical variables. Comparisons between groups were done using an unpaired *t*-test [4]. For comparing categorical data, χ^2 test was performed. Exact test was used instead when the expected frequency is less than 5 [5]. *P* values less than 0.05 were considered statistically significant.

3. Results

A total number of 26 post-COVID patients with mucormycosis are enrolled in this retrospective study with age mean \pm SD (54.42 ± 10.18) with minimum age is 36 y and a maximum age is 75 years. All descriptive basic parameters are illustrated in Table 1. Facial nerve palsy presented in 46.2% of our study. Eight out of 26 patients needed surgical debridement. More than 80% are on oral therapy for controlling their diabetic disease. The patients who received corticosteroids include 84.6% of the studied group. According to the clinical

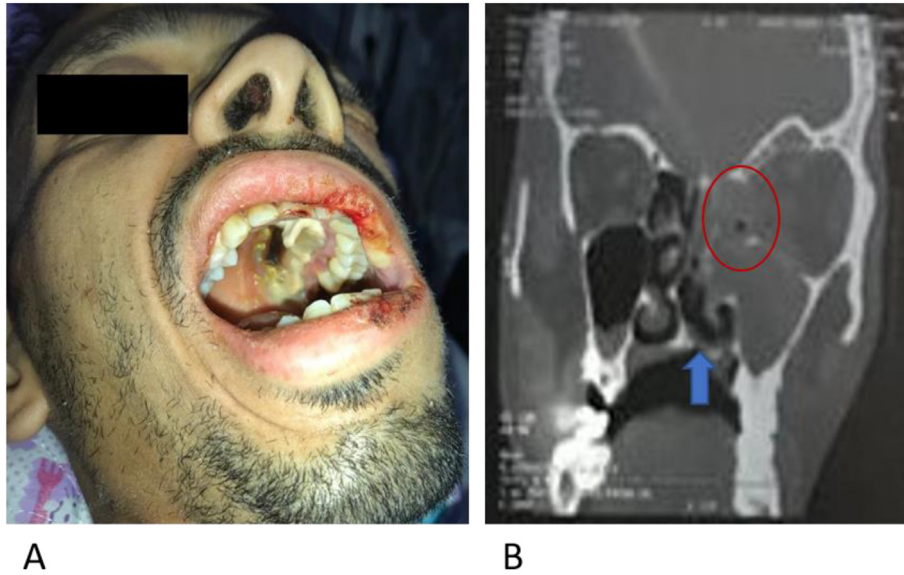


Fig. 2. A 36-year-old male with grade (2) rhino orbital palatal mucormycosis. (A) photography shows ipsilateral facial nerve palsy. (B) computed tomography of PNS shows left maxillary and ethmoidal opacity with palatal erosion (blue arrow) and lamina papyracea involvement (red oval circle).

grading; 50% of the patients are present in the grade (1) while only 7.7% are evaluated in the grade (4). More than 80% of the patients do not have radiological evidence of intracranial extension.

The patients are classified into three age groups to investigate each age group's characteristics, which is presented in a Table 2. We observe that the patients under age groups less than 60 years are diabetics and a large sector of them are on the steroids medication post-COVID infection. The patients need surgical debridement present in the age groups less than 60 years.



Fig. 3. A 60-year-old male present with grade (4) rhino-orbito-cerebral with facial skin involvement. Flaccid face either due to bilateral facial palsy or patient coma with glasco coma scale 3/15.

Table 1. Demonstrate the descriptive characteristics of the post-coronavirus disease patients with mucormycosis.

	N (%)
Age	
Mean ± SD	54.42 ± 10.18
Age groups	
30 to 45	6 (23.1)
45 to 60	14 (53.8)
>60	6 (23.1)
Sex	
M	10 (38.5)
F	16 (61.5)
DM	
Yes	25 (96.2)
No	1 (3.8)
DM treatment	
Insulin	4 (16)
Oral	21 (84)
Smoking	
Yes	10 (38.5)
No	16 (61.5)
Facial palsy	
Yes	12 (46.2)
No	14 (53.8)
Clinical grading	
Grade 1	13 (50)
Grade 2	7 (26.9)
Grade 3	4 (15.4)
Grade 4	2 (7.7)
Steroid	
Yes	22 (84.6)
No	4 (15.4)
Intracranial extension (Radiological)	
Yes	5 (19.2)
No	21 (80.8)
Surgery	
Yes	8 (30.8)
No	18 (69.2)

Table 2. Age groups of the post-coronavirus disease patients with mucormycosis with other variables.

	Age groups		
	30–45 [n (%)]	45–60 [n (%)]	>60 [n (%)]
Sex			
M	3 (50)	5 (35.7)	2 (33.3)
F	3 (50)	9 (64.3)	4 (66.7)
DM			
Yes	6 (100)	14 (100)	5 (83.3)
No	0	0	1 (16.7)
DM treatment			
Insulin	0	2 (14.3)	2 (40)
Oral	6 (100)	12 (85.7)	3 (60)
Smoking			
Yes	3 (50)	5 (35.7)	2 (33.3)
No	3 (50)	9 (64.3)	4 (66.7)
Facial palsy			
Yes	4 (66.7)	6 (42.9)	2 (33.3)
No	2 (33.3)	8 (57.1)	4 (66.7)
Sex			
Grade 1	3 (50)	8 (57.1)	2 (33.3)
Grade 2	2 (33.3)	3 (21.4)	2 (33.3)
Grade 3	1 (16.7)	2 (14.3)	1 (16.7)
Grade 4	0	1 (7.1)	1 (16.7)
Steroid			
Yes	5 (83.3)	12 (85.7)	5 (83.3)
No	1 (16.7)	2 (14.3)	1 (16.7)
Intracranial extension (Radiological)			
Yes	1 (16.7)	2 (14.3)	2 (33.3)
No	5 (83.3)	12 (85.7)	4 (66.7)
Surgery			
Yes	2 (33.3)	6 (42.9)	0
No	4 (66.7)	8 (57.1)	6 (100)

Assessment of the facial nerve palsy with other variables is illustrated in Table 3. Facial palsy is widely distributed among all age groups and although the *P* value is not statistically significant but the clinical significance of our observation regarding facial nerve palsy distribution among different age groups, diabetic patients, smoking, and steroid therapy indicates that facial neuropathy becomes one of the presenting manifestations in the post-COVID patients with mucormycosis.

46.2% of the patients present with facial nerve palsy. One of them with the lower half of facial palsy could be due to upper motor neuron palsy or direct invasion of peripheral branches. We observe left facial palsy in eight (66.7%) of the patients and right facial palsy in four (33.3%) of the patients. One (8.3%) patient with paradoxical facial palsy where the rhino orbital mucormycosis present in the left side while facial nerve palsy in the right.

We can't assess the facial nerve palsy in the clinical grade 4 where two (16.7%) patients with extensive facial skin involvement due to a poor general condition with Glasco coma scale 3/15 or it could be due to bilateral facial neuropathy.

Table 3. Relation of facial nerve palsy in the post-coronavirus disease patients with multiple variables as age, sex, DM, smoking, clinical grades, steroids therapy, and patients who underwent surgery with corresponding *P* value.

	Facial palsy (N = 12) [n (%)]	No facial palsy (N = 14) [n (%)]	<i>P</i> value
Age			
Mean ± SD	52.08 ± 10.55	56.43 ± 9.77	0.287
Age groups			
30 to 45	4 (66.7)	2 (33.3)	0.662
45 to 60	6 (42.9)	8 (57.1)	
>60	2 (33.3)	4 (66.7)	
Sex			
M	7 (70)	3 (30)	0.105
F	5 (31.3)	11 (68.8)	
DM			
Yes	11 (44)	14 (56)	0.462
No	1 (100)	0	
DM treatment			
Insulin	2 (50)	2 (50)	1
Oral	9 (42.9)	12 (57.1)	
Smoking			
Yes	7 (70)	3 (30)	0.105
No	5 (31.3)	11 (68.8)	
Grades			
Grade 1	4 (30.8)	9 (69.2)	0.145
Grade 2	5 (71.4)	2 (28.6)	
Grade 3	3 (75)	1 (25)	
Grade 4	0	2 (100)	
Steroid			
Yes	9 (40.9)	13 (59.1)	0.306
No	3 (75)	1 (25)	
Intracranial extension (Radiological)			
Yes	3 (60)	2 (40)	0.635
No	9 (42.9)	12 (57.1)	
Surgery			
Yes	5 (62.5)	3 (37.5)	0.401
No	7 (38.9)	11 (61.1)	

Significant *P* value if less than 0.05%.

8 patients underwent surgical debridement with a confirmational histopathological result showing the characteristic hyphae with necrosis in the field (Fig. 4).

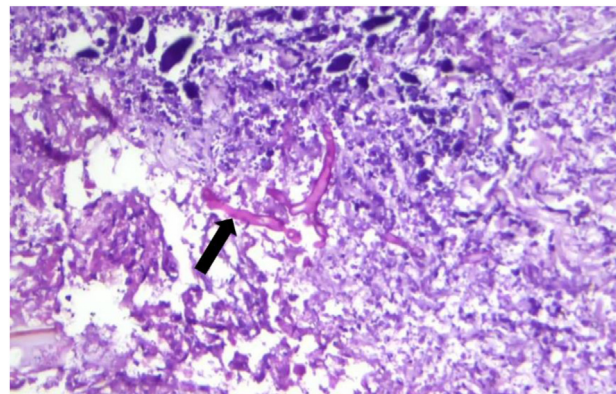


Fig. 4. Microscopic examination with H and E showing a broad, aseptate, and branching hyphae (black arrow) with necrosis of the background field.

4. Discussion

Immunocompromised conditions of the post-COVID patients with uncontrolled diabetes and long steroid therapy aggravate the exacerbation of mucormycosis.

Facial nerve palsy is demonstrated with mucormycosis in the literature. Multiple works of literature document a case report of facial nerve paralysis in the uncontrolled diabetic patient with mucormycosis [6–8].

The prevalence of facial nerve palsy in our study is 46.2% indicate the high presentation of facial neuropathy among post-COVID patients with mucormycosis. The range of facial neuropathy in patients with mucormycosis may be 11% up to 77% in the different literature [9,10].

One (8.3%) patient with contralateral facial neuropathy. Pathogenesis includes either synchronous Bell's palsy or neuropathy from mucormycosis [1,11].

Facial palsy is widely distributed among all age groups and although the *P* value is not statistically significant but the clinical significance of our observation regarding facial nerve palsy distribution among different age groups, diabetic patients, smoking, and steroid therapy indicate that facial neuropathy becomes one of the presenting manifestations in the post-COVID patients with mucormycosis. This observation is agreed with Reddy *et al.* who demonstrated that facial palsy has a common presentation during COVID-19 infection in India [12].

Ipsilateral facial neuropathy could be due to either direct spread from pterygopalatine fossa to pterygomaxillary fissure then infratemporal fossa to directly invade facial nerve or resistance of arteries in diabetics expose the facial nerve for edema with subsequent neuropathy [6,10] the facial nerve palsy could not be assessed in the clinical grade 4 where two patients (16.7%) one of them among age group (45–60) and the second case in the age group (>60) are presented with extensive facial skin involvement due to a poor general condition with Glasco coma scale 3/15 or it could be due to bilateral facial neuropathy through direct involvement, multiple cranial neuropathy associated with coronavirus epidemic waves during 2020 and 2021, mucorales thrives to peripheral nerves, intracranial extension with higher centers affection, facial edema, or synchronous Bell's palsy [10,13].

Micro thrombosis in the COVID-19 infection could be exacerbate facial palsy, also spread of mucormycosis to Eustacian tube and middle ear increase number of patients presented with facial palsy [14,15].

75% of the diabetic patients with facial palsy have a history of steroid therapy post-COVID infection that could explain the immunocompromised state of the patients and progression to mucormycosis.

Meticulous follow-up of the post-COVID diabetic patients with strict control for steroid therapy could decrease the exacerbation of mucormycosis and associated facial palsy.

More research for this entity as multi-center and cohort study with a large number of cases is required to ensure the prevalence and the prognosis of facial nerve paralysis among these critical immunocompromised patients with a sever and still have a high mortality rate although recent advances of medication and diagnostic nasal endoscopy.

4.1. Conclusion

Facial nerve palsy emerges as a usual presenting clinical manifestation in post-COVID diabetic patients with mucormycosis. Mucormycosis is highly suspicious in any diabetic patient with facial neuropathy, a history of steroid therapy, and orbital complain.

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Institutional review board (IRB) approval number

IHS00031.

Conflicts of interest

The author(s) declared no potential conflicts of interest.

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