Clinical Profile of Patients with Hemifacial Spasm at a Tertiary Eye Care Center in South India: A Retrospective Study

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Abstract

Purpose: To assess the incidence and clinical profile of hemifacial spasm (HFS) and the association between HFS and systemic diseases.

Methods: This retrospective study was carried out on 85 patients with HFS, presenting at a tertiary eye care center in South India. Demographic and clinical details were recorded for all patients. Of these, the patients who had undergone magnetic resonance imaging (MRI) of the brain were analyzed for primary and secondary HFS.

Results: The mean age of the patients was 56.11 ± 12.51 years. The age at onset of HFS was 54.9 ± 12.7 years. The disease duration was 9.51 ± 7.28 years. Male:female ratio was 1:1.17. The right side was involved in 31 patients (36.47%) and the left side in 54 patients (63.52%). MRI was performed in 54 (63.52%) patients and showed neurovascular conflict in 22 (40.74%) patients and space-occupying lesions in 2 (3.70%) patients. Forty-nine (57.64%) patients had primary HFS, while five (5.88%) patients had secondary HFS due to old facial palsy in 3 and space-occupying lesions in two patients. Twenty (23.52%) patients received botulinum toxin A with a good response. Type of HFS had a significant association with hypertension ($P = 0.046$) while no significant association was present between laterality of HFS and systemic diseases ($P > 0.05$ each). Multivariate analysis showed a marginally significant association between type of HFS and hypertension ($P = 0.057$).

Conclusions: Primary HFS was the main type of HFS with female dominance and predilection for the left side. Hypertension had a relationship with HFS that needs to be investigated further for its causal nature.

Keywords: Clinical profile, Etiology, Hemifacial spasm, Incidence, India

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Introduction

Hemifacial spasm (HFS) is a neurological disorder characterized by unilateral, uncontrollable contractions of the facial muscles. It often has an insidious onset.[1] Starting from the orbicularis oculi muscle, contractions progress to the lower face with time.[2] HFS has been classified as primary or secondary based on the causes. Primary HFS denotes the contractions caused by the facial nerve's hyperactivity due to compression at the nerve's root exit zone.[3] Secondary HFS is defined as the involvement of the facial motor nucleus or an insult to the peripheral course of the nerve caused by trauma, tumors, inflammation, or demyelination.[4] Primary HFS is more common and it generally presents in the fifth or sixth decade of life. HFS is almost always unilateral, unlike blepharospasm, which is frequently bilateral and symmetrical.[5]

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Typically, an abnormal superior or anterior inferior cerebellar artery (AICA) compresses the facial nerve as it exits the brainstem.[6,7] Mass lesions in the cerebellopontine angle (CPA), trauma, and infections are less common causes.[4]

The clinical profile of HFS and the management options may vary in different parts of the world depending on the facilities available in a particular region. Moreover, the relationship between hypertension and HFS remains controversial with a paucity of information, regarding the connection between HFS and other systemic diseases such as diabetes mellitus and coronary artery disease. Hence, this study was done to assess the incidence and clinical profile of patients with HFS and the association between HFS and coexisting systemic diseases.

Methods

This retrospective study included patients with HFS presenting to the neuro-ophthalmology clinic at a tertiary eye care center in South India from November 2019 to December 2021. The study was approved by the institutional ethics committee (No. RET201900380 dated March 3, 2022) and was in accordance with the Declaration of Helsinki and its later amendments. Out of 9916 patients attending the neuro-ophthalmology clinic, 85 patients were found to have HFS. A detailed history of the patients was obtained, including demographic profile, etiology, and clinical history with special reference to any systemic illness and facial nerve palsy. The severity of HFS was measured by the Likert scale (a 5-point scale from 0 to 4 [0 = not affected; 1 = mild; 2 = moderate; 3 = severe; and 4 = very severeand prolonged spasm]).[8] Findings of the clinical examination were recorded, including examination of the 5th, 6th, 7th, and 8th cranial nerves. Findings of magnetic resonance imaging (MRI)/magnetic resonance angiography (MRA) of the brain were recorded.

Patients with HFS who had undergone neuroimaging were further categorized into patients with primary HFS and those with secondary HFS. The diagnosis of primary HFS was based on a lack of a history of facial palsy or trauma and the absence of facial muscle weakness attributable to previous facial palsy on clinical examination. The diagnosis of secondary HFS was based on a clear history of prior facial palsy, signs of facial palsy on clinical examination, and demonstration of abnormalities of the facial nerve by neurophysiological and neuroradiological investigations.[9-11] Detailed observations were made, regarding management given to the patients. Indications for starting botulinum toxin A treatment in patients with HFS were the severity of HFS and the functional disability experienced by the patients.

Peak improvement was assessed using the visual analog scale and recorded in percentages (0%–100%). Response to botulinum toxin A treatment was graded on the basis of the degree of HFS as "excellent" (no residual spasm), "good" (HFS resolved more than 75%), "fair" (spasm relief of 50% to 75%), "poor" (spasm relief of 25% to <50%), and "failure" (spasm relief <25%). The range of follow-up period was from 6 to 18 months.

Hypertension was defined as blood pressure ≥130/80 mmHg for conventional office-based measurement.[12] The diagnosis of type 2 diabetes mellitus was made according to the American Diabetes Association criteria.[13] Thyroid disorders were diagnosed on the basis of medical history, physical examination, and thyroid function tests.

Statistical analysis

The data were analyzed using IBM SPSS software version 23 (IBM Corp. Released 2018. IBM SPSS Statistics for Windows, Armonk, NY, USA). Continuous variables were expressed as mean ± standard deviation and qualitative variables as numbers and percentages. Chi-square or Fisher's exact test was used to determine the association between two variables. Multivariate analysis was performed using binary logistic regression to determine the independent predictors of various HFS-related variables. P <0.05 was considered statistically significant.

Results

A total of 85 patients were included in the study. The mean age of the study population was 56.11 ± 12.51 years (age range, 17–87 years). HFS started at the age of 54.9 ± 12.7 years (range, 14–82 years) while the disease duration was 9.51 ± 7.28 years (range, 0.5–35.0 years). Female dominance was seen in the study group (male:female ratio: 1:1.17). The male:female ratio was 1:1.33 among primary cases and 1:1.5 among secondary cases of HFS. HFS predominantly affected the left side of the face (left versus right: 63.52% vs. 36.47%).

MRI was done in 54 (63.52%) patients. Neurovascular compression of the 7th cranial nerve was suspected in 22 (40.74%) patients. Neuroimaging showed the AICA to be the most common vessel compressing the facial nerve at the root exit zone (n = 8, 36.36%), followed by the vertebral artery (n = 6, 27.27%), posterior inferior cerebellar artery (PICA) (n = 4, 18.18%), vascular loop whose exact anatomy could not be identified (n = 3, 13.63%), and superior cerebellar artery (n = 1, 4.54%).

Two (3.70%) patients had space-occupying lesions out of 54 patients who underwent MRI scans-one had a vestibular schwannoma [Figure 1a-d] and the other one had a cavernoma in the temporal lobe. MRI scan of the brain was normal in 30 patients. Among the remaining 31 patients who did not undergo an MRI of the brain, history and clinical examination findings were not indicative of traumatic, inflammatory, or neoplastic disease of the facial nerve. As such, confirmed primary HFS was present in 49 patients with HFS (22 with neurovascular conflict and 27 with normal MRI brain) while five patients had secondary HFS, out of which two patients had space-occupying lesions on MRI and three patients had resolved facial nerve palsy. The latent period between facial palsy and the onset of HFS was 26.41 ± 7.32 months. The type of HFS was not ascertained in 31 patients who did not undergo an MRI study of the brain. Hypertension was the

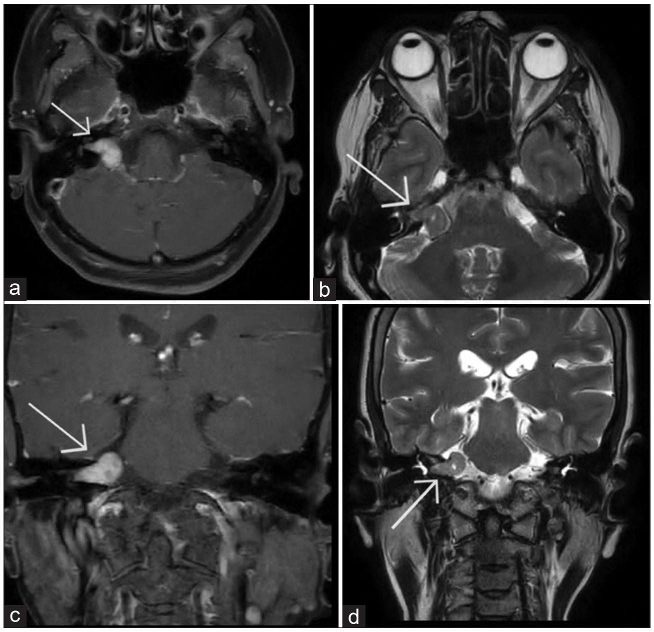

Figure 1: (a) T1-weighted axial, (b) T2-weighted axial, (c) postcontrast T1-weighted coronal, and (d) T2-weighted coronal magnetic resonance images showing a right-sided vestibular schwannoma in a patient with hemifacial spasm

most prevalent systemic disease ($n = 26$, 30.58%) in our study, followed by diabetes mellitus ($n = 14$, 16.47%) and coronary artery disease ($n = 6$, 7.05%) [Table 1].

Age, gender, and laterality of HFS did not show a significant association with the type of HFS ($P > 0.05$ each). A significant association was seen between hypertension and the type of HFS ($P = 0.046$). No significant association was seen between hypertension and the laterality of HFS ($P = 0.144$). The type of HFS and the laterality of HFS did not have a significant association with diabetes mellitus, coronary artery disease, cerebrovascular accident, and thyroid disorders ($P > 0.05$ each) [Tables 2 and 3].

Multivariate analysis showed hypertension as close to being statistically significant regarding its association with the type of HFS ($P = 0.057$). No independent association was seen between the type of HFS and age, gender, diabetes, coronary artery disease, cerebrovascular accident, and thyroid disorders ($P > 0.05$ each). No independent association was present between the laterality of HFS and age, gender, hypertension, diabetes, coronary artery disease, cerebrovascular accident, and thyroid disorders ($P > 0.05$ each) [Table 4].

Treatment with botulinum toxin A was given in 20 (23.52%) patients. According to the region affected, botulinum toxin A was administered subcutaneously into multiple sites, including orbicularis oculi, zygomaticus major, nasalis, mentalis, and procerus muscles using a 1-ml tuberculin syringe with a 30-gauge needle under sterile conditions. Injections were avoided near the angle of the mouth to avoid potential postinjection drooling. Twenty-five, 40, or 50 units were injected according to the severity of the spasm. The average initial dose used was 37.5 units. Both primary and secondary HFS cases received the same dose. The patients showed a good response that lasted for 3–6 months. On

Table 1: Demographic, clinical, and neuroimaging features of patients with hemifacial spasm (n=85)

Characteristic	Number of patients (%)
Age group (years)	
17–40	6 (7.05)
41–60	47 (55.29)
>60	32 (37.64)
Gender	
Male	39 (45.88)
Female	46 (54.11)
Socioeconomic status[a]	
High	0
Middle	15 (17.64)
Low	70 (82.35)
Clinical profile	
Type	
Primary	49 (57.64)
Secondary	5 (5.88)
Not determined	31 (36.47)
Unilateral involvement	
Right side	31 (36.47)
Left side	54 (63.52)
Severity of HFS	
Not affected	9 (10.58)
Mild	8 (9.41)
Moderate	38 (44.70)
Severe	19 (22.35)
Very severe	11 (12.94)
MRI findings (n=54)	
Neurovascular conflict	22 (40.74)
Arteries involved	
AICA	8 (36.36)
VA	6 (27.27)
PICA	4 (18.18)
NI	3 (13.63)
SCA	1 (4.54)
Vestibular schwannoma	1 (1.85)
Cavernoma	1 (1.85)
Normal	30 (55.55)
Associated systemic diseases	
Hypertension	26 (30.58)
Diabetes	14 (16.47)
CAD	6 (7.05)
CVA	5 (5.88)
Thyroid disorders	4 (4.70)
Botulinum toxin A administration	20 (23.52)

[a]Socioeconomic status: High (annual income >Indian rupees [INR] 850,000; 1 US dollar equals 82.90 INR), middle (annual income INR 50,000–850,000), and low (annual income <INR 50,000). AICA: Anterior inferior cerebellar artery, HFS: Hemifacial spasm, VA: Vertebral artery, PICA: Posterior inferior cerebellar artery, NI: Vascular loop whose exact anatomy could not be identified, SCA: Superior cerebellar artery, CAD: Coronary artery disease, CVA: Cerebrovascular accident, MRI: Magnetic resonance imaging

Table 2: Factors associated with the type of hemifacial spasm (n=54)

Characteristic	Number of patients		P*
	Primary HFS (n=49)	Secondary HFS (n=5)	
Age group (years)			
17–40	4	0	0.773
41–60	21	3	
>60	24	2	
Gender			
Male	21	2	>0.999
Female	28	3	
Laterality of HFS			
Left side	32	3	>0.999
Right side	17	2	
Systemic diseases			
Present	23	4	0.350
Absent	26	1	
Hypertension			
Present	15	4	0.046
Absent	34	1	
Diabetes			
Present	5	2	0.120
Absent	44	3	
CAD			
Present	3	1	0.330
Absent	46	4	
CVA			
Present	3	2	0.062
Absent	46	3	
Thyroid disorders			
Present	3	0	>0.999
Absent	46	5	

*Based on Fisher's exact test. HFS: Hemifacial spasm, CAD: Coronary artery disease, CVA: Cerebrovascular accident

Table 3: Association between systemic diseases and laterality of hemifacial spasm

Systemic disease	Number of patients		P*
	Right-sided HFS (n=31)	Left-sided HFS (n=54)	
Hypertension			
Present	6	20	0.144
Absent	25	34	
Diabetes			
Present	6	8	0.806
Absent	25	46	
CAD			
Present	1	5	0.408
Absent	30	49	
CVA			
Present	2	3	>0.999
Absent	29	51	
Thyroid disorders			
Present	0	4	0.291
Absent	31	50	

*Based on Chi-square test or Fisher's exact test. HFS: Hemifacial spasm, CAD: Coronary artery disease, CVA: Cerebrovascular accident

a subjective scale of 0%–100% improvement, the mean peak effect of botulinum toxin A was 84.09% ±4.23%. None of the patients developed an allergic reaction to the toxin. Three patients developed mild lagophthalmos, following the administration of botulinum toxin A. Ten additional patients who were advised of this injection refused to give consent for the procedure. Out of these, 2 had received botulinum toxin A injections earlier at other centers. Thirteen patients who were advised botulinum toxin A could not afford it due to financial reasons. Five patients received subsequent doses of botulinum toxin A after 3 months due to a waning relief in the symptoms. In 15 patients, injection frequency was tailored as per response. Patients having noncompressive lesions and those refusing to take botulinum toxin A or unable to afford it were managed with carbamazepine either alone or in combination with benzodiazepines and/or baclofen.

Discussion

India is a country of great racial diversity, with a wide variety of different ethnic groups. Differences in the pattern of various diseases may be present in different regions with populations of different ethnicities. HFS is a common but relatively underreported neurological disorder. In the current study, we report data from a large cohort of patients attending a tertiary eye care center in South India. Except for minor differences, our study broadly shows the same findings, concerning HFS in South India as observed in other studies conducted by Pandey and Jain[8] and Batla *et al.*[14] in North India.

Primary HFS was ten times more common than secondary HFS in our study. This is in concurrence with primary HFS: secondary HFS ratio of 9.6:1 reported by Banerjee *et al.*,[15] although other studies conducted in North India also have reported dominance of primary HFS but of lesser magnitude.[8,14]

Female dominance was seen in HFS cases overall (male:female ratio: 1:1.17). However, female dominance was appreciated better among primary (male:female ratio: 1:1.33) and secondary HFS cases (male:female ratio: 1:1.5), when for analysis, we analyzed only those cases who had undergone MRI of the subgroup brain. Similarly, other studies have reported that HFS is more common in females.[16,17]

The left side of the face was more commonly involved than the right side. Several studies have reported this and it is postulated that this may probably be related to the anatomy of the vertebrobasilar system.[16,18] In general, the AICA and PICA are the most implicated vessels in the neurovascular compression. The left vertebral artery is usually larger than the right one.[19,20] As the AICA and PICA, arise, respectively, from the basilar and vertebral arteries, the inequality in the size of vertebral arteries may be responsible to some extent for the increased frequency of NVC on the left side.

Table 4: Multivariate analysis showing the independent association between various factors and hemifacial spasm-related variables

Parameter	HFS-related variables							
	Laterality of HFS				Type of HFS			
	OR	95% CI		*P**	OR	95% CI		*P**
		Lower	Upper			Lower	Upper	
Age	1.02	0.98	1.06	0.278	1.00	0.88	1.14	0.923
Gender	0.91	0.34	2.41	0.854	0.11	0.004	2.70	0.177
Hypertension	2.46	0.71	8.48	0.153	30.18	0.90	1010.81	0.057
Diabetes	0.45	0.12	1.71	0.246	0.00	0.00	>1.0E12	0.975
CAD	1.76	0.13	22.40	0.663	0.23	0.004	14.18	0.491
CVA	0.55	0.07	4.12	0.565	12.33	0.36	421.55	0.163
Thyroid disease	0.00	0.00	>1.0E12	0.971	20.15	0.30	1342.95	0.161

*Based on binary logistic regression. CI: Confidence interval, HFS: Hemifacial spasm, CAD: Coronary artery disease, CVA: Cerebrovascular accident, OR: Odds ratio

Hypertension emerged as the most common systemic association in our study sample. A statistically significant association was found between hypertension and the type of HFS ($P = 0.046$). Defazio *et al*.[18,21] and Banerjee *et al*.[15] have also stressed this point earlier. Arteriosclerosis of the arteries causes thickening of the vessel wall and consequent compression of the facial nerve at the root exit zone, where it is devoid of epineurium, predisposing this area to demyelination and resultant abnormal movements. Moreover, on performing multivariate analysis, the finding of the association between hypertension and the type of HFS being close to statistical significance ($P = 0.057$) corroborates this finding. In contrast, we did not find any significant association of type of HFS with other systemic diseases such as diabetes mellitus, coronary artery disease, and cerebrovascular accidents where diffuse atherosclerotic involvement of arteries was more likely. Systemic diseases including hypertension did not show any significant association with the side involved due to HFS. Our findings are in agreement with the observations of Batla *et al*.,[14] although Nakamura *et al*.[22] had shown an association between arterial hypertension and neurovascular compression of the left rostral ventrolateral medulla in patients with left primary HFS.

Neuroimaging helps to differentiate between primary and secondary cases. Although an MRI was ordered for all presenting cases, only 54 (63.52%) patients underwent the investigation. The main reasons for this include the cost of the investigation and poor motivation to undergo tests due to monetary considerations. For those patients who did go ahead with the investigation, NVC by AICA was recognized as the most common cause of NVC among patients having primary HFS (36.36% of cases). Our findings are in accordance with the research findings of Batla *et al*.[14] and Miller and Miller.[23] However, Mercier and Sindou reported PICA to be the major conflicting vessel.[24] Bell's palsy was the most common cause of secondary HFS, in accordance with earlier research.[25]

Tumors account for 0.3%–2.5% of all HFS and include meningiomas, vestibular schwannomas, and epidermoid tumors.[26] The 3.70% prevalence rate of tumors among our cases that underwent MRI of the brain is a bit higher than that reported in the medical literature. Aside from CPA tumors, secondary HFS is also caused by vascular aneurysms and CPA cysts.[27] This emphasizes the importance of neuroimaging in all cases of HFS, as HFS can be an early and innocuous symptom of a far more sinister disease. The study of choice for detecting various intracranial pathologies responsible for primary and secondary HFS is MRA. Neuroimaging is recommended in all cases of HFS.[15]

Clinical examination can lead to a diagnosis of secondary HFS only in cases with antecedent facial palsy. Early detection of curable CPA tumors with neuroimaging allows for proper treatment, such as tumor resection and microvascular decompression.[28,29]

At our center, a low percentage of patients with HFS received botulinum toxin A injections as the majority of patients were of poor socioeconomic status and were unable to afford the treatment. Moreover, some patients were unwilling to receive the injections. The mean initial dose of 37.5 units used by us was higher than the mean dose of 21.8 units in the primary spasm and 17 units in the secondary spasm given by Pandey and Jain[8] who observed that secondary HFS cases required lower dosages of botulinum toxin due to higher chances of adverse reactions in secondary HFS. However, we did not notice such a difference. The injections were efficacious and had minimal complications, except for mild lagophthalmos developing in three patients. This is in contrast to ptosis, which is the more frequently reported complication. Five patients received subsequent botulinum injections after 3 months while among 15 patients, the frequency of administration of botulinum toxin was lesser due to relief in spasms extending up to 6 months. Difficulty in visiting the hospital due to coronavirus disease 2019 (COVID-19)-related restrictions might also have contributed to some extent in this regard as the major part of our study was focused on the time period when COVID-19 was at its peak in India. However, the adjustment of the time of administration of botulinum toxin A in our study is supported by the recommendations of Girard *et al*.[30] that the botulinum toxin A injection pattern and frequency should be customized according to the response. Patients sought treatment with botulinum toxin A only for functional reasons. None of the patients were cosmetically oriented. Patients who refused the botulinum treatment were managed conservatively with carbamazepine alone or with benzodiazepines and/or baclofen as per response.

This study suffers some limitations. First, MRI findings were not available for all patients which restricted the number of patients for analysis for the primary or secondary nature of HFS. Second, some patients did not give their consent for the administration of botulinum toxin A which limited the assessment of efficacy and adverse effects of botulinum toxin.

Thus, HFS generally affects people from the fourth decade onwards and mostly occurs as the primary HFS. It is more common in females and on the left side.

Clinical distinction between primary and secondary HFS is difficult. Neuroimaging should be performed in all patients with HFS to distinguish between primary and secondary HFS and identify the conflicting vasculature responsible for primary HFS so that appropriate treatment can be initiated at the earliest. Of various systemic diseases, hypertension has an association with the type of HFS which needs to be explored further for its causal nature.

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Conflicts of interest
There are no conflicts of interest.

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