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CLINICOPATHOLOGICAL STUDY WITH TOPODIAGNOSIS OF LOWER MOTOR NEURON FACIAL NERVE PALSY

ENT

Dr. Abhishek Rajagopal Post Graduate Student In Department Of ENT And Head And Neck Surgery, Gandhi Medical College, Bhopal (M.P.).

Dr. Smita Soni Professor And Head, Department Of ENT And Head And Neck Surgery, Gandhi Medical College, Bhopal (M.P.).

Dr. Yashveer J. K. Associate Professor, Department Of ENT And Head And Neck Surgery, Gandhi Medical College, Bhopal (M.P.).

Dr. Kirti Y. K. Assistant Professor, Department Of ENT And Head And Neck Surgery, Gandhi Medical College, Bhopal (M.P.).

Dr. Ritu Rani Vinodia* Post Graduate Student In Department Of ENT And Head And Neck Surgery, Gandhi Medical College, Bhopal (M.P.). *Corresponding Author

ABSTRACT

Background: Facial expression is a fundamental part of human communication and is one of the main means of expressing emotions and providing non-vocal intimation. Facial nerve has a long course intracranially and runs through a bony canal known as fallopian canal. Hence this makes it more susceptible to injury in comparison to other nerves in the body. Aim: To determine the etiopathological factors responsible for LMN facial nerve palsy and the most common level of facial nerve injury. **Materials and Methods:** A Prospective study conducted in a tertiary care center in the department of Otorhinolaryngology & Head and Neck Surgery. **Result:** Out of 60 patients studied, 70% were males and 30% were females. The commonest age group was from 21 to 30 years (28.33%). The commonest etiology was chronic otitis media accounting to 35%. Tympanic segment of facial nerve was seen to be most involved (33.33%). Most patients presented with grade 4 facial palsy at onset (58.33%). **Conclusion:** Most causes of LMN facial palsy can be diagnosed clinically and early diagnosis with prompt treatment brings better results. FNP in cases of CSOM without cholesteatoma has better prognosis. Tympanic segment of facial nerve was seen to be more frequently involved.

KEYWORDS

Facial nerve palsy, topodiagnostic tests, Chronic otitis media, tympanic segment.

INTRODUCTION

Facial expression is a fundamental part of human communication and is one of the main means of expressing emotions and providing non-vocal intimation.

Facial nerve has a long course intracranially and runs through a bony canal known as fallopian canal. Hence this makes it more susceptible to injury. Besides the psychosocial factors, facial nerve palsy significantly impairs essential functions of the face, including, cornea protection, blinking, nasal breathing, lip competence and speech, and facial expressions. Thus, prompt diagnosis with appropriate treatment can show a favourable prognosis.

Etiology of Facial palsy includes the idiopathic form (Bell's palsy) which accounts for 60–75% of cases[1], Temporal bone fractures, Infections like otitis media (acute and chronic otitis media, tubercular otitis media) Malignant otitis externa, Ramsay hunt syndrome, Congenital, Tumours, Autoimmune disorders like multiple sclerosis and Iatrogenic injuries. The cause of idiopathic or Bell's palsy is incompletely understood, but there is some evidence that latent infection with herpes simplex type 1 plays a role in its etiology.[2,3] Reactivation of the virus is thought to cause inflammation of the facial nerve, resulting initially in neuropraxia which is reversible and finally Wallerian degeneration. Facial palsy with vesicular eruptions of the ear is known as Ramsey-Hunt Syndrome (RHS). RHS has a longer course compared to Bell's Palsy and symptoms can deteriorate over several weeks.

To evaluate a patient with facial nerve palsy, a thorough history and physical examination is to be done. History should elucidate the onset, progression, associated symptoms, and risk factors. Complete examination of the head and neck, including an assessment of all branches of the facial nerve and other cranial nerves, parotid gland and neck palpation, should be performed. Observing the face at rest and involuntary action allows assessment of the degree of paralysis. The patient is asked to close eyes firmly, elevate the eyebrows, smile, and frown, puff up the cheeks, pucker the lips and tense the neck to assess the platysma. The face is observed for synkinesis, which indicates aberrant nerve regeneration. Presence of vesicles or rashes is examined in the external ear which may indicate Ramsay Hunt Syndrome.

The degree of facial paralysis can be graded using standard grading scales, such as the House Brackmann scale. Topodiagnostic tests are done to find the site of lesion. Radiological investigations like HRCT and MRI to know about intratemporal segment of facial nerve. Electro-physiological testing in cases of trauma to know about the degree of dysfunction and chance for recovery are indicated in facial nerve palsy patients.

MATERIALS & METHODS

The present study is a Prospective Observational analysis and was conducted in a tertiary care center in a teaching hospital in the department of Otorhinolaryngology, from January 2021 to August 2022. Permission from institutional ethical committee was taken, keeping all ethical issues in mind. The study population consisted of patients with LMN type of facial nerve palsy due to various etiologies like Trauma, CSOM, Herpes, Malignant otitis externa, Malignancy etc. A total of 82 patients were selected for the study. Among these, twenty patients were lost to follow-up and two did not consent for the study and were excluded. 60 patients gave full consent, were studied, and followed up after 3 and 6 months respectively. Inclusion Criteria: Patients aged 10 to 70 years of either sex with LMN facial nerve palsy. Exclusion Criteria: Patients with upper motor neuron palsies, multiple cranial nerve palsies and patients with motor neuron disease. Methodology: Detailed history followed by otological examination was done in all patients. Pure tone audiometry, topo-diagnostic tests including Schirmer's test, stapedial reflex, electrophysiological testing and computed tomography of Temporal bone was done in selected individuals according to their etiology.

All patients were either given conservative treatment with steroid therapy, culture sensitive antibiotic/antiviral therapy alone or those requiring surgical interventions were operated on. Patients diagnosed with LMN type of facial nerve palsy were then followed up after 3 and 6 months following the initial diagnosis. During follow up, patients were examined for improvement of the House-Brackmann grade and the topodiagnostic tests were applied to determine level of involvement of facial nerve.

OBSERVATIONS AND RESULTS

After performing detailed ENT history and examinations, patients were prospectively analyzed, followed up at 3- and 6-months interval and details were noted. Informed consent was taken from the patients.

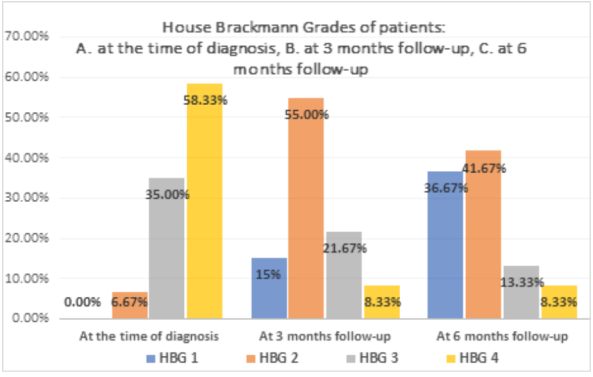
60 patients gave full consent, were studied, and followed up after 3 and 6 months respectively. The most common age group was seen to be from 21 to 30 years, accounting to 17 patients (28.33%).

Distribution of etiology of the study subjects was as follows: 26 (43.33%) cases accounted for Infectious etiologies, 17 (28.33%) cases were due to traumatic lesions as result of temporal bone fractures after road traffic accidents or due to instrumental injuries. Idiopathic cause accounted for 14 (23.3%) cases. 1 (1.67%) case was due to malignancy of the parotid gland involving the facial nerve. 2 (3.33%) cases were due to iatrogenic injury to the facial nerve during mastoid exploration surgery.

After clinical examination, at the time of diagnosis, the distributions of House-Brackmann grade of facial nerve palsy due to the various etiologies was noted in the study population.

Patients were followed up after 3 months (Visit 1) and 6 months (Visit 2) of diagnosis.

Table 1: Distribution of House-Brackmann grades of facial nerve palsy in the study population at the time of diagnosis, at 3 months follow-up and at 6 months follow-up.



At the time of diagnosis, 58.3% patients had grade 4 FNP. At visit 1- most of the patients recovered to grade 2. At visit 2- 36.6% patients had recovered to Grade 1.

To determine the approximate level of facial nerve involvement, Topodiagnostic tests were applied in all patients. Schirmers test, stapedial reflex and chemical taste tests were conducted at the time of diagnosis and subsequent visits.

A. Schirmer's Test: An impairment in schirmers test implies an involvement above the first genu of the facial nerve. At the time of diagnosis, 65% (39) patients had no impairment in tear production and remaining 35% (21) patients showed an abnormality in tear production with associated symptoms of dryness and irritation in the affected eye (Tear levels less than or equal to 5mm in 5 minutes). At 3 months and 6 months follow-up the patients showed an improvement in the schirmers test. 38.10% patients improved to more than 10mm of tear levels on filter paper strip in 5 minutes and 61.90% patients showed no change after 3 months. Further 71.43% patients improved and only 28.57% patients remained abnormal in tear production levels at 6 months' follow-up. Association of Schirmer test with etiology: In the study population 21 patients (35%) showed an abnormal Schirmer test at the time of diagnosis (p value=0.545). after 6 months' follow-up, only 6 patients (10%) had an abnormal Schirmer test suggestive of an improvement in the lacrimation of these patients after treatment (p value = 0.901). The values noted were not statistically significant. From the time of diagnosis to the first follow up, 13 patients showed stagnant Schirmer tests and 8 patients improved. Among these, maximum cases improved in cases with infectious and idiopathic etiologies (42.86% each), (p= 1). At second follow up, 15 patients improved and 6 patients showed stagnant results. Maximum recovery was noted in cases with idiopathic cause (5 patients, 71.43%).

B. Stapedial Reflex: Stapedial reflex was elicited in all patients through Impedance Audiometry. An absent stapedial reflex (SR) implies an involvement of the facial nerve above the origin of the nerve to stapedius. At the time of diagnosis, 43 patients (71.67%) had absent SR while 17 patients (28.33%) had a normal SR. At 3 months follow up, an improvement was noted in the patients with 27 patients (45.00%) showing normal SR with a further improvement after 6 months where a total of 39 patients had improved (65.00%). Association of stapedial reflex with etiology: At the time of diagnosis 43 patients (71.67%) had an absent stapedial reflex (SR) of which 21 patients (80.77%) belonged to the infectious etiology category followed by cases due head injury with 13 patients (76.47%). 17 patients (28.33%) showed presence of stapedial reflex. At first follow up, after 3 months there was a decrease in the number of patients who had an absent SR to 33 (55%) and after 6 months follow up a total of 21 patients (35%) had an absent SR. (p = 0.005 & p = 0.006 respectively). Cases due to Head Injury showed maximum improvement with 6 (46.15%) patients showing presence of SR after initial absence and at second follow up, 22 patients improved and 21 patients remained stagnant (p= 0.009 & p= 0.02 respectively).

C. Taste Sensations: Test for changes in taste was done via chemical taste test wherein filter paper strips impregnated with chemical agents pertaining to specific tastes (Sweet-sucrose, sour-citric acid, salty-sodium chloride, and bitter-caffeine) were used. The strips were placed on anterior two thirds of the tongue at different points on either half of the tongue depending on the side involved. Those patients with alterations (abnormal taste perception/no taste perception) in any one or more of the specific tastes were considered to show an altered result. At the time of diagnosis 39 patients (65.00%) showed an altered taste perception. At 3- and 6-months follow-up the number of patients with altered taste perception reduced to 17 (28.33%) and 11 (18.33%) patients respectively. 81.67% patients showed improvement in taste after 6 months. Association of taste sensation with etiology: At first follow up, after 3 months the number of patients with altered taste reduced to 17 (28.33%) and at second follow up after 6 months this number further reduced to 11 (18.33%). These values were not statistically significant. 22 patients (56.41%) improved in terms of taste sensations after 3 months and this number increased to 28 patients (71.79%) after 6 months follow up. Both cases (100%) of iatrogenic FNP improved at 6 months follow up and 12 cases (80%) of head injury showed improvement. These values observed, were statistically insignificant.

Table 2: Association of segment of facial nerve involved with etiology.

Segment of facial nerve involved	Idiopathic (n=9)	Infectious (n=26)	Iatrogenic (n=2)	Malignancy (n=1)	Head Injury (n=17)	Total	P value
Labyrinthine	0 (0 %)	0 (0 %)	0 (0 %)	0 (0 %)	3 (17.65%)	3 (5.45 %)	0.002 *
First genu	7 (77.78%)	6 (23.08%)	0 (0 %)	0 (0 %)	3 (17.65%)	16 (29.09%)	
Tympanic part	1 (11.11%)	14 (53.85%)	2 (100 %)	0 (0 %)	3 (17.65%)	20 (36.36%)	
Second genu	1 (11.11%)	4 (15.38%)	0 (0 %)	0 (0 %)	4 (23.53%)	9 (16.36%)	
Mastoid segment	0 (0 %)	2 (7.69%)	0 (0 %)	0 (0 %)	4 (23.53%)	6 (10.91%)	
Extratemporal	0 (0 %)	0 (0 %)	0 (0 %)	1 (100 %)	0 (0 %)	1 (1.82%)	
Total	9 (100 %)	26 (100 %)	2 (100 %)	1 (100 %)	17 (100 %)	55 (100 %)	

Segment of facial nerve involved: Based on the topodiagnostic tests, the segment of facial nerve involved was determined and it was observed that the tympanic segment of the facial nerve was seen to be most frequently involved (36.36%). The most common segment involved among all etiologies was also the Tympanic segment (20 cases, 36.36%) followed by the first genu (16 cases, 29.09%). Among specific etiologies, idiopathic cases had the first genu mostly involved (77.7%), infectious and iatrogenic trauma cases had the tympanic part involvement (53.85% and 100% respectively), Head Injury cases showed involvement of the second genu as well as mastoid segment equally involved (23.53% each). The single malignant case showed involvement of the extratemporal segment of facial nerve. These

observations were statistically significant (p=0.002).

Management of diagnosed cases: Following the diagnosis all patients were assessed for whether medical management would suffice or required an additional surgical intervention. 36 patients were treated medically and remaining 24 patients had surgical interventions done additional to the medical treatment. 16 patients underwent MRM, 3 facial nerve decompressions, 3 cortical mastoidectomies and 2 radical mastoidectomies. Medical management included oral steroids with prednisolone 1mg/kg with dose-tapering along with antiviral coverage with acyclovir in select cases. Symptomatic and supportive management for associated underlying conditions was given simultaneously. Surgical management was done additionally in patients not responsive to medical therapy or if the etiology calls for a surgical intervention.

DISCUSSION

In our study, the common etiologies of lower motor neuron facial nerve palsy were evaluated. Infectious etiology was predominant with squamosal chronic otitis media being the most common followed by FNP as a result of head injury. Cases due to malignancies and iatrogenic trauma were rare. The tympanic segment of facial nerve is more prone to injury in all etiologies as per our study with 36.36% cases showing involvement of tympanic segment (p=0.002). these findings were like those by Yetiser et al[4](58.3%), Ikeda et al[5](94%) and Quaranta et al[6](92.3%).

The second genu (23.53%) and mastoid segment (23.53%) were seen to be involved more in cases of head injury/temporal bone fractures. Yetiser and Hidir et al reported the mastoid segment to be involved more commonly in these cases (31.58%)[7].

Jamshidi et al[8] and Selesnick et al[9] reported that the most common site of injury of facial nerve due to iatrogenic trauma after middle ear surgeries was seen to be the tympanic segment (50%), (55%) (81%) respectively which was consistent with our study as well (100%).

Cases of Bell's palsy or idiopathic facial nerve palsy showed an involvement of the geniculate ganglion (77.78% of patients with Bell's palsy) based on findings from MRI and HRCT scans of patients in our study. Kohsyu et al, in their study showed FNP due to bell's palsy showed involvement in the geniculate ganglion (100%).[10] Kinoshita et al in their reported that 91% of patients with bell's palsy showed contrast enhancement of geniculate ganglion or the tympanic-mastoid segments.[11]

There was a significant spontaneous improvement (28.33% to 65%), (p=0.006) in stapedial reflex of patients after 6 months follow up. The presence or absence of the stapedial reflex was earlier reported to be useful to predict the prognosis of FNP as reported by Hydean et al[12]. Ikeda Et al also, found that the presence or absence of the stapedial muscle reflex was significantly related to the prognosis of paralysis.[13] In our study 85.7% of the patients with bell's palsy had a normal Schirmer test after second visit after 6 months indicating an improvement in tear production following initial injury. This was also noted by Peitersen in their study where 97% patients with bell's palsy achieved normal tear production.[14]

The taste test used in our study is semiquantitative and based on recognition of four basic tastes—sweet, salt, sour and bitter. Initial taste examination at the time of diagnosis, in our study showed that 65% of patients had partially reduced or abolished taste while 35% had normal taste. Taste examination after 6 months showed that 81.6% of patients had regained normal taste function. A similar finding was reported by Peitersen et al in their study with 80% patients showing recovery.[14]

CONCLUSION

Our study showed that LMN facial nerve palsy is a common clinical entity that shares various etiologies. In our geographical area the most common cause of FNP was due to infections involving the middle ear - Chronic otitis media with cholesteatoma and Ramsay-Hunt Syndrome followed by those due to head injuries. The most common segment of the facial nerve insulted in the various etiologies was seen to be the tympanic segment. Facial nerve palsy has a wide range of differential diagnoses and possible anatomical and psychosocial consequences. A thorough investigation must be performed to determine the cause of the palsy and to direct treatment. Medical treatment with steroids and an antiviral cover should be started at the earliest after onset of symptoms, if the cause of FNP cannot be determined. Time to recovery and resolution can vary with etiology, but overall, the prognosis is good.

LIMITATIONS

1. Many patients after first day of diagnosis and getting medicines, were lost to follow up. Many elderly patients were not troubled too much by minor grades of FNP upon recovery and hence did not seek further treatment and follow up.
2. Due to second wave of COVID-19 pandemic a larger sample size could not be achieved as patients had difficulty with transport and hence were also lost to follow up.
3. Patients with multiple segments of facial nerve involvement were not included as topodiagnosis was difficult to achieve in these cases.

Conflict Of Interest: Authors declared. There is no conflict of interest.
Ethical Issues: This study was ethical approved by Institutional Ethical Committee.

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