

Recovery of Facial nerve Paralysis after temporal Bone Fracture: Analytical study of results of Surgical and Medical Management at Tertiary Care Centre

¹Dr Naveen Kumar, ²Dr Amisha Garg, ³Dr Shailly Raj,

¹Associate Professor, Department of ENT, Government Medical College, Saharanpur, U.P.

²Senior Resident, Department of Ophthalmology, Government Medical College, Saharanpur, U.P.

³Associate Professor, Department of Ophthalmology, Government Medical College, Saharanpur, U.P.

Correspondence

Dr Shailly Raj

Associate Professor, Department of Ophthalmology, Government Medical College, Saharanpur, U.P.

Email: esri.57@gmail.com

Abstract

Facial nerve injury and post traumatic facial nerve paralysis after temporal bone fracture are the challenge regarding its management. It is controversial to decide whether it should be managed conservatively alone or should undergo surgical management. It is also a dilemma that when to operate and how much the nerve to decompress. The main aim of our study to set the criteria regarding decision making for the management of patient having facial nerve paralysis after temporal bone fracture. We also analyze postoperative results or recovery of patients underwent surgical procedures. In this study we select and analyze 18 patients having temporal bone fracture from 2016 to 2022. Patient evaluate and assessed clinically, audiological and also with electrophysiological diagnostic techniques. All 18 patients receive medical treatment initially. Then based on the criteria of complete clinical paralysis at onset, no improvement with conservative treatment and fibrillation potential in EMG, only 7 patients underwent surgical

decompression through transmastoid approach. In these patient lesions found predominantly in geniculate ganglion area. Analysis of results done after 12 months after the day of injury. In medically managed patients i.e. 11 patients, 90% had good recovery (H B grade I- II) and in surgically managed patients i.e. 7, 80% patients have good recovery. The patient selection for medical and early surgical intervention based on clinical examination and judicious use of electrodiagnostic tests plays a vital role in outcome in the management of posttraumatic facial nerve paralysis.

Introduction

Commonest cause of facial nerve injury reported are road traffic accidents (1,2). Due to these injury and facial bone fracture there may be permanent deformities may occur. They should be treated promptly and efficiently (3).

It may be acute onset facial palsy which occurs within hours of injury or it may be delayed facial palsy which occur after couple of days of injury due to secondary nerve ischaemia cause by edema in the facial canal. Initially facial palsy may be missed due to facial edema caused by injury (4).

Temporal bone fracture is reported commonly in head injury in RTA. In these case High resolution computer tomography (HRCT) of head is the main stay of investigation.

Temporal bone fracture can be divided in to longitudinal, transverse or mixed fracture based on the relation of the fracture line with the axis of the petrous bone (5).

In a study it is stated that longitudinal fractures are most common 70-80%, followed by transverse (10-20%) and mixed (10%) fracture. (6)

There are few techniques and test to examine and functional analysis of facial nerve as electroneuronography (ENOG), electromyography (EMG), nerve excitability test (NET) and maximum stimulation test (MST).

In case of facial paralysis use of ENOG is advocated by Ulug and Arif Ulubil with first week of onset of disease (7). EMG is used in late cases of facial paralysis.

If EMG shows fibrillation potentials indicating complete loss of nerve function reaction

Other criteria or indication for surgical exploration are ENOG shows bilateral amplitude ratio of more than 90% or NET shows a difference of more than 3.5 mA or MST shows no reaction.

Still there are many controversies regarding management of facial nerve trauma. Usually management whether it is surgical or medical depends upon the onset of and extent of facial nerve weakness.

On the basis of clinical examination it is considered that early onset and complete facial nerve paralysis indicate the disruption of continuity of nerve, on the other hand delayed onset and partial paresis may be suggestive of secondary swelling or compression of the nerve, which may recover with the time and we can avoid immediate surgical exploration (3).

Material and methods

A prospective study was carried out on 18 cases of temporal bone fracture reporting between 2016 to 2022 in tertiary care center in western UP.

Inclusion criteria

Patient with intra temporal facial nerve palsy who were managed with a minimum 12 months follow up. All the patient included in the study we received the informed consent.

Exclusion criteria

- 1) Patient with supranuclear facial nerve palsy and other intracranial complication post injury.
- 2) Patient having injury to the extratemporal part of facial nerve are excluded from the study.
- 3) Patient with less than 12 months follow up.
- 4) Patient of RTA having cochlear damage were excluded.

All patient reported to department underwent HRCT of the head, to rule out other intracranial component.

All patient full fill the inclusion criteria underwent a through clinical examination. Otoscopy, tuning fork test was done in each patient. All audiological evaluation with pure tone audiometry, stapedial reflex were also done in each patient.

After the onset of paralysis EMG done after 2 weeks then regular weekly follow up with all clinical examination was done along with require serial EMG. Each patient received the medical treatment of tablet prednisolone with starting dose of 1 milligram/ kg /day in tapering manner over 3 weeks. Physiotherapy and rehabilitation included and given to all patient. Patient with immediate and complete paralysis and no improvement with medical treatment and on EMG shows total denervation fibrillation potential underwent or planned for surgical exploration.

Facial decompression procedure

All the patient planned for surgical intervention, postauricular incision was given, cortical mastoidectomy was done then posterior tympanotomy done. Extended subtotal facial nerve was exposed from vertical segment to stylomastoid foramen. The malleous head and incus bone was removed. The bone layer overlying facial nerve removed and with nerve sheath slit along with bone spicules and hematoma around the nerve cleared so that nerve got decompressed.

All surgical precautions like to avoid thermal damage through irrigation done.

Additional ossiculoplasty done with prosthesis or by refashioning the incus in case of traumatic damage.

Patient was followed up at regular interval.

Result

Table no. 1 – Total no. of Patients selected

S.NO.	TOTAL NO. OF PATIENT	TOTAL NO. OF MALE PATIENT	TOTAL NO. OF FEMALE PATIENT
1.	18	15 (83.3%)	3 (16.6%)

In our study we include the patient between age of 15-45 years underwent road traffic accident. There were 18 cases included in the study out of which 15 cases (83.3%) were male and 3 cases (16.6%) were female.

Table no. 2 – Type of fracture

S.NO.	TYPE OF FRACTURE	NO. OF PATIENTS	% OF PATIENT
1.	Longitudinal fracture	12	66.67%
2.	Transverse fracture	5	27.78%
3.	Mixed	1	5.56%
	Total	18	

In all cases (18) HRCT had there were 12 cases (66.67%) of longitudinal fracture, 5 cases (27.78%) of transverse fracture and only one case (5.56%) having mixed type of fracture.

Table no. 3 – Site of Injury

s.no.	Site of injury	No. of patient	% of patient
1.	Geniculate ganglion	10	55.56%
2.	Horizontal segment	6	33.34%
3.	Vertical segment	2	11.12%
	Total	18	

After HRCT head we also classify the patient on the basis of site of injury in the facial nerve. In our study there were 10 cases (55.56%) having injury at geniculate ganglion (which is most common site) 6 cases (33.34%) having injury at horizontal segment and only 2 patient (11.12%) having injury at vertical segment of facial nerve.

Table no. 4

s.no.	Onset of paralysis	No. of patients
1.	Immediate	10 (53.56%)
2.	Delayed (after 24 hrs)	8 (44.4%)

In all reported cases, we note the facial paralysis immediately in 10 patients (55.56%) but paralysis appears after 24 hours in 8 cases (44.4%).

Table no. 5 – Grading of Facial Paralysis

s.no.	House backmann grading of facial paralysis	No. of patient
-------	--	----------------

1.	I - II	6 (33.33%)
2.	III - IV	4 (22.22%)
3.	V - VI	8 (44.44%)

Out of all cases ie 18 cases we classify the patient on the clinical basis having facial paralysis under House Brackmann grading system, for having effective management decision. There were 6 cases (33.33%) classify under grade I and II, 4 cases (22.22%) classify under grade III- IV and 8 cases (44.44%) classify under grade V-VI.

Table no. 6

s. no.	Type of management	No. of patient
1.	Only medical treatment	11(61.11%)
2.	Mixed management (medical + surgical)	7 (38.89%)

We done surgical nerve exploration in 7 cases (38.89%) out of 8 having grade V- VI facial nerve paralysis according to House Brackmann grading system, and 11 cases treated conservatively.

Table no. 7 patient recovery in medically managed patient

s. no.	Management	Facial paralysis grading	No. of patient at the time of onset	No. of patient at 12 months
1.	Nonsurgical	I - II	6	9
		III - IV	4	2
		V - VI	1	0
		Total	11	

Table no. 8 Recovery in patients receiving surgical treatment

Type of surgical management	Toatal no. of patients	Preop grading of facial paralysis	Grading after 12 months
Facial nerve decompression surgery	7	VI	II
		VI	II
		V	I
		VI	III
		V	II
		V	I
		VI	I

The patient managed conservatively were 11 cases (61.11%), the 6 cases were having facial nerve paralysis of grade I-II recovered completely in 12 months. Out of 4 patient which were having paralysis of House Brackmann grade III- IV at the time of reporting to hospital, 3 recovered to grade I and 1 patient of House Brackmann grade V paralysis shown recovery up to grade III after 12 months. 8 patients reported with House Brackmann grade V-VI paralysis out of which 7 patient underwent facial nerve decompression or surgical intervention within 4

week of injury and had regular followup in all patient. Again on completion of study of period of 12 month we classified the patient on the basis of House Brackmann grading. We conclude that 6 patients out of 7 recovered up to grade I-II and only one patient recovered up to grade III only.

DISCUSSION

Facial nerve paralysis has the strong association with temporal bone fracture (4). In India road traffic accidents are the commonest cause for temporal fracture.

Facial nerve is most visible and having significant physiological, emotional impact in comparison to other nerve paralysis or neuropathy.

These patients present and managed late by ENT surgeon as prior neurosurgical emergency management needs before facial nerve trauma management.

In the study conducted by Dr Yadav S. et al (8) conclude that decompression surgery is beneficial if performed within early days of injury. A study conducted by Diaz R.C. et al also conclude about the treatment after temporal bone fracture (9). In our study only patient having H B grade V- VI i.e. seven patients underwent the decompression surgery and out of them 6 patients recovered to grade I-II.

Coker et al (10) have observed that 14 patients out of 18 have longitudinal fracture of temporal bone and they need the facial nerve exploration. Ulug and Ulubil (7) reported 7 of 11 fractures to be of longitudinal type in their surgical treatment series. All the cases show injury in geniculate ganglion or perigeniculate areas. In our study the maximum no. of patient i.e. 12 out of 18 have longitudinal fracture then the transverse or mixed type. In these patients commonest site injury was in the geniculate ganglion i.e. 10 out of 18 patients.

To plan for surgical treatment (facial nerve decompression surgery) electrodiagnostic test results are very useful on medical treatment if the patient is not recovering but the facial paralysis persist more than 2 weeks the EMG (electromyography) is useful. Electroneurography (ENoG) showing more than 90% of facial nerve degeneration and electromyography (EMG) shows no regeneration potentials planned for surgical management. The presence of voluntary polyphasic reinnervation potential on EMG, were found to be a good

prognostic factor and best indicator that regeneration is taking place. The result in the study by the Dahiya et al (11) shows the similar outcome for patient managed conservatively to HB grade I and II as our study.

Many studies show better outcome after the early surgical decompression surgery than the medical conservative treatment in facial paralysis after trauma (12,13). And same studies prefer the medical management over surgical in such cases, as Darrouzet et al (14) shows that more than 90% recovery in patients managed conservatively.

References

1. Devriese P.P.: Facial Paralysis After Trauma of the Skull. W: Traumatology of the Skull Base, Ed.: M. Samii, J. Brihaye, Springer, Berlin 1983.
2. Chang C, Case S. Management of facial nerve injury due to temporal bone trauma. Am J Otol. 1999; 20:96–114.
3. Yetiser S. Total facial nerve decompression for severe traumatic facial nerve paralysis: a review of 10 cases. Int J Otolaryngol. 2012.
4. Patel A, Groppo E. Management of temporal bone trauma. Craniomaxillofac Trauma Reconstr. 2010;3(2):105–113.
5. Ulrich K. Verletzungen des Gehörorgans bei Schadelbasisfrakturen (Ein Histologisch und Klinische Studie) Acta Otolaryngol Suppl. 1926;6:1–150.
6. Gordon E, Thomas S, Ducic Y, Arnaoutakis D. Facial nerve trauma: evaluation and considerations in management. Craniomaxillofac Trauma Reconstr. 2015;8(1):1–13.
7. Ulug T, Ulubil SA. Management of facial paralysis in temporal bone fractures: a prospective study analyzing 11 operated fractures. Am J Otolaryngol. 2005;26(4):230–238.
8. Yadav S., Panda N.K., Verma R., Bakshi J., Modi M.: Surgery for post-traumatic paralysis: are we overdoing it? Eur Arch Otorhinolaryngol, 2018; 275(11): 2695–2703.

9. Diaz R.C., Cervenka B., Brodie H.A.: Treatment of Temporal Bone Fractures. *J Neurol Surg B Skull Base*, 2016; 77(5): 419–429.
10. Coker NJ, Kendall KA, Jenkins HA, et al. Traumatic intratemporal facial nerve injury: management rationale for preservation of function. *Otolaryngol Head Neck Surg*. 1987;97(3):262–269.
11. Dahiya R, Keller J, Litofsky N, et al. Temporal bone fractures: otic capsule sparing versus otic capsule violating clinical and radiographic considerations. *J Trauma*. 1999;47(6):1079–1083.
12. xu P., Jin A., Dai B., Li R., Li Y.: Surgical timing for facial paralysis after temporal bone trauma. *Am J Otolaryngol.*, 2017; 38(3): 269–271.
13. Lee P.H., Liang C.C., Huang S.F., Liao H.T.: The Outcome Analysis of Traumatic Facial Nerve Palsy Treated with Systemic Steroid Therapy. *J Craniofac Surg.*, 2018; 29(7): 1842–1847.
14. Darrouzet V. Management of facial paralysis resulting from temporal bone fractures: our experience in 115 cases. *Otolaryngol Head Neck Surg*. 2001;125(1):77–84.