

Original Research Article

Role of topodiagnostic tests in evaluation of facial nerve palsy in head injury

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ABSTRACT

Background: Head injury with temporal bone trauma manifests with facial nerve palsy. The site of lesion can be assessed by various tests.

Methods: A retrospective study of 500 cases of head injury was undertaken to study the role of topodiagnostic tests in localising the site of lesion in 48 patients of facial palsy. The study was undertaken by the otology services of Dayanand medical college and hospital, Ludhiana during a period of one year.

Cases: 500 cases admitted with head injury were screened. The cases with facial nerve paralysis were then enrolled in the study.

Results: In 48 patients of facial palsy, taste sensation was diminished in 67% (21 cases); acoustic reflex absent in 86.8% (33 cases) and Schirmer's test showed reduced lacrimation in 29.1% (14 cases).

Conclusions: The topodiagnostic tests do not always localise the site of lesion in head injury.

Keywords: Head injury, Facial palsy, Topodiagnosis, Schirmer's test, Acoustic reflex

INTRODUCTION

Trauma to the neurocranium with paralysis of facial nerve is usually secondary to involvement of the nerve in its intratemporal course. This nerve in its approximately 28mm intratemporal course transit through the bony fallopian canal is affected by intraneural hematoma, the fractures; longitudinal, transverse and mixed, of the petro-mastoid temporal bone.

Fracture line proximal, distal or in between the greater superficial petrosal nerve, the stapedial nerve and the chorda tympani, can be localised by simple clinical tests of functional integrity of that respective branch. The schirmer's test of lacrimation, the acoustic stapedial reflex test and the test of gustation are labelled as the topodiagnostic tests. The Bento E et al study of 873

patients, at the facial nerve group of hospital das clínicas, São Paulo University, emphasised that the suprageniculate lesions are responsible for 50% of the facial nerve involvement in varied etiologies.¹ Vis a vis these results, the neuro-otologist can develop a rationale for therapy and surgical access to facial nerve lesions.

Objective of study

To study relevance of topodiagnostic tests of facial palsy in head injury.

METHODS

A retrospective study of 500 cases of head injury was undertaken to study the role of topodiagnostic tests in localising the site of lesion in 48 patients of facial palsy.

The study was undertaken by the neuro-otology clinics of oto rhinolaryngology and head neck services of Dayanand medical college and hospital, Ludhiana during a period of one year.

500 cases admitted with head injury were screened. The cases with facial nerve paralysis were then enrolled in the study. The patients with lower motor neuron type of facial paralysis were screened with the following tests:

Topodiagnostic tests

These test are used to locate the site of injury without prognostic value. In Schirmer's test, branch tested was greater superficial petrosal nerve, technique employed was, 5 mm strips of filter paper were placed in inferior fornix for 5 minutes and the length of paper moistened was compared between two eyes. Assessment was done for >75% unilateral decrease in lacrimation or bilateral decrease in lacrimation (<10 mm for both sides in 5 minutes).

In Stapedial reflex, branch tested was nerve to stapedius 28, technique employed was impedance audiometry for stapedial reflex. Assessment was done for presence or absence of stapedial reflex.

In Testing taste, branch tested was chorda tympani, technique employed was, testing with solutions concentrated with sugar, salt, bitter, sour, with protruded tongue, solutions were placed over anterior two thirds of tongue on either side separately. After wiping the tongue, the patients were made to recognize the taste without retracting the tongue.

Inclusion criteria were, patients of head injury of any age and sex, patients of head injury with Glasgow Coma Scale (GCS) more than 3, patients with intratemporal pathology confirmed by above tests, patients with complete paralysis, immediate onset paralysis and delayed onset paralysis not responding to conservative management. Exclusion criteria were, patients of head injury due to gunshot or missile injuries, patients with GCS more than 4 at the time of presentation but who subsequently do not regain consciousness, patients whose CT scan and other investigations were not possible, patients suffering from any concomitant major illness like diabetes, hypertension etc, patients suffering from any ear disorder prior to injury and patients associated with cerebrovascular accidents.

Statistical analysis

All statistical analysis was performed using Microsoft Excel and statistical package of social sciences (SPSS) version 17 for Microsoft windows (SPSS Inc. Released 2008. SPSS statistic for windows, version 17.0, Chicago).

RESULTS

The topodiagnostic tests were performed to evaluate the site of injury. The results of three tests are depicted in Tables 1-3.

Table 1: Taste sensation on anterior two third of tongue (n=31).

Taste sensation	No. of patients, N (%)
Diminished	21 (67.7)
Preserved	10 (32.2)

Table 2: Result of acoustic reflex (n=38).

Acoustic reflex	No. of patients, N (%)
Present	5 (13.1)
Absent	33 (86.8)

Table 3: Results of Schirmer's test (n=48).

Schirmer's test	No. of patients, N (%)
Equal	34 (70.8)
Reduced	14 (29.1)

Taste was tested on the anterior two thirds of tongue separately on each half. The test was done successfully in 31 patients. Seventeen patients due to altered sensorium were unable to give reliable results. Taste was diminished in 21 (67.7%) patients and preserved in 10 (32.2%) patients.

Acoustic stapedial reflex was recorded in 38 patients. It was unsuccessful in 10 patients with tympanic membrane perforation. The reflex was present in 5 (13.1%) and absent in 33 (86.8%) patients.

Stimulated lacrimation was tested in all patients. It was found to be equal in 34 (70.8%) patients and reduced in 14 (29.1%) patients.

DISCUSSION

Site and degree of paralysis

The topodiagnostic tests were performed to localize the site of injury. Taste sensation on the anterior two third of the tongue was checked in 31 patients. It was found to be diminished in 21 (67.7%) patients and preserved in 10 (32.2%) patients. Being a subjective test its accuracy varies. Moreover, variation in the branching pattern of the facial nerve can be another factor responsible for some of the cases with preserved taste sensation despite injury to the second genu area.²

Acoustic reflex was recorded for 38 patients. It was present in 5 (13.1 %) patients and absent in 33 (86.8%) patients. Although this is an objective test, it is important to emphasize that the presence of some kind of hearing

loss in either ear may invalidate the interpretation of facial nerve function. Dobie 1986, also concluded that the test was useless in the majority of cases because temporal bone fractures usually produced a severe sensorineural hearing loss or conductive loss.³

Function of greater superficial petrosal nerve was measured by Schirmer's test. Schirmer's test was found to be equal in 34 (70.8%) of the patients. This was decreased in 14 (29.1%) patients thus indicating injuries proximal to the nerve. Tschiasny and others 1953 popularized the site of lesion testing, of which lacrimal flow assessment (Schirmer's test) was thought to be the most accurate topodiagnostic test.⁴

Lambert and Brackmann in their review of 26 cases of longitudinal temporal bone fractures used Schirmer's test as the main indicator of the site of facial nerve injury.⁵

Gantz and colleagues demonstrated that lacrimation testing predicted the site of injury in 61% of the patients. In the present study out of 9 cases explored surgically, the correlation between the topodiagnostic test and site of injury on exploration was found in only 3 patients. Thus these tests do not appear useful in deciding the site of injury preoperatively.⁶

Renou et al using Schirmer's test and measurement of the stapedial reflex carried out a topodiagnostic analysis in a series of 45 cases of Bell's palsy. The aim of this study was to define the exact location of the nerve lesion in order to guide the possible choice of surgical decompression of the facial nerve. They noted the existence of a geniculate or suprageniculate lesion in 62% of cases.⁷ A study of the global literature showed marked controversies in the various publications. This has led to discussion of the value and interpretation of the topographical test battery.

The main lacrimal gland innervated by a parasympathetic nerve via the greater petrosal nerve, secretes the enzyme, lysozyme in tears lysozyme activity in tears was analysed in 10 cases of unilateral facial paralysis due to the cerebellopontine angle (CPA) tumor and 10 normal cases. The lysozyme concentration in tears on the paralysed side collected by Schirmer number 2 test was significantly lower than that on the healthy side, or bilateral sides of normal subjects. This decreased concentration on the paralysed side is due to the interruption of the reflex arc at the level of CPA. It is concluded that our new method is more useful for topographical diagnosis of facial paralysis than is the conventional Schirmer's filter paper test.⁸

Faleiros emphasized that the stapedius muscle plays an important role in auditory physiology. Its function may be assessed using a test named impedancemetry, where its reflex is measured. For the stapedial reflex to function, it is necessary that the middle ear and the afferent and efferent pathways are intact. Several pathologies of the

middle and internal ear, as well as other otoneurological disorders and systemic illnesses, may change the physiology of the stapedius muscle.⁹

Ide, Morimitsu et al 1988 compared the stapedial reflex of 30 patients with peripheral facial nerve paralysis with the results of facial paralysis scores. Utilizing stimulation frequencies 500, 1,000 and 2,000 Hz for both ipsilateral and contralateral stimulation. The stapedial reflex test at 500 Hz for contralateral stimulation was found to be ideal for evaluating the degree of facial paralysis. With 500 Hz or 1,000 Hz contralateral stimulation, the stapedial reflex test seemed to be useful for predicting the prognosis for facial nerve paralysis. In these stimulations, cases with a positive reflex within 2 weeks showed complete recovery within 12 weeks, and cases with positive reflex within 4 weeks showed recovery within 24 weeks.¹⁰

The lack of correlation between test results and location of lesion is related to a number of factors: The anatomy of the facial nerve and its branches is quite variable, allowing axons to take a variety of alternate pathways to reach their termination. The lesion responsible for paralysis may affect different components of the nerve at various levels. Recovery of various components may occur at different times. The technique used to measure various facial nerve functions may not be completely reliable. The degree of paralysis can be assessed by electrodiagnostic tests. These tests are thought to be the most reliable prognostic indicator available.

CONCLUSION

The topodiagnostic tests of facial palsy do not always localise the exact site of lesion.

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