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A STUDY ON HEARING IMPAIRMENT IN PATIENTS WITH FRACTURE TEMPORAL BONE

ENT

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ABSTRACT

BACKGROUND: Hearing impairment due to fracture temporal bone is one of the common problems dealt by otorhinolaryngologist. Most of them are due to Road Traffic Accidents (RTA). Hearing loss is a common complaint following fracture temporal bone, but it is frequently overlooked as there may be other life threatening complications associated with it, which may require immediate attention.

AIM: The main objective of this study is to find the percentage of occurrence of hearing impairment in fracture temporal bone, and to correlate the degree and type of hearing impairment to various types of fracture temporal bone.

MATERALS AND METHODS: This study was conducted in department of Otorhinolaryngology Government Medical College Thrissur, for a period of one year from December 2016 to December 2017. It was an observational cross sectional study comprising 51 patients who were enrolled based on inclusion and exclusion criteria, detailed history and clinical examination, Computed Tomography (CT) scan of head and High Resolution Computed Tomography (HRCT) of temporal bone. All patients underwent Pure Tone Audiometry (PTA), and Tympanometry to assess the hearing status and to confirm the hearing impairment. PTA and tympanometry was repeated after two months to assess the prognosis of hearing. Data collected was tabulated and analyzed.

RESULTS: Out of 51 cases with fracture temporal bone, hearing loss was present in 88% of cases. Conductive hearing loss was the most common type up to 43.1%, followed by 35.2% of mixed hearing loss, and 10% sensory neural hearing loss. Based on the degree of hearing loss it was observed that incidence of mild hearing loss 29.4%, moderate hearing loss 27%, moderately severe hearing loss 24%, profound hearing loss in 5.9% and severe hearing loss in 2% cases.

CONCLUSION: Fracture temporal bone causes significant impairment of hearing. Various types of fractures have particular effects on type and degree of hearing.

KEYWORDS

Fracture temporal bone, Hearing impairment, HRCT Temporal bone, Pure Tone Audiometry, Tympanometry.

INTRODUCTION

Head injury is a common feature of all major trauma cases and patients with a moderate or severe head injury have a high rate of morbidity and mortality. Victims are often left with permanent neurological disability. Motor vehicle accidents are the one of the most common cause of head trauma with varying degrees and severity. One of the major concern of otolaryngologist in this scenario is hearing loss, vestibular dysfunction and central auditory problems. Hearing loss following head trauma can be due to central or peripheral causes, middle ear or cochlea being the most common site of peripheral injury. Temporal bone fracture is one of the common causes of hearing loss in head injury patients.

Post traumatic hearing loss can have profound impact on patients emotional and physical as well as social well being. Permanent hearing loss can also affect occupation of individuals that may lead to economical crisis. In developing countries like India this study is very relevant because of the increasing prevalence of road traffic accidents.

Our study was conducted in clinically and radiologically proven temporal bone fracture cases attended in surgery, neurosurgery and ENT departments of Government Medical College Thrissur between December 2016- December 2017.

AIM OF STUDY:

To assess the percentage of occurrence of hearing impairment in patients with fracture temporal bone and to correlate the degree and types of hearing impairment with various types of fracture temporal bone.

MATERIALS AND METHODS:

This study was conducted for a period of one year from December 2016 to December 2017. Prior to commencement, the study was approved by the ethical committee of the medical college. This study was conducted in 51 patients who presented to the ENT department, Government medical college, Thrissur, with fracture temporal bone which included referred patients from surgery and neurosurgery departments.

Study Design: Observational Cross sectional study.

Sample Size: Jack momoseK,Kenneth R Davis et al[1] conducted a prospective study on total of 103 cases of skull fracture involving the temporal bone and found a prevalence of 66% of hearing impairment in study population. Sample size calculated based on the formula

N=4PQ/D*D

P=Prevalence =66 Q=100-p=34 D=allowable error=20% of P=13.2

N = 4*66*34/13.2*13.2=51. Sample size is 51.

Study Period:
1 year, from December 2016 – December2017

Participants:
Patients consulted in department of ENT with fracture temporal bone.
Inclusion Criteria: Patients with clinical and radiological evidence of fracture temporal bone.

Exclusion Criteria:
Patients with poor GCS score and those with previous diagnosis of any type of hearing loss were excluded. Patients with any kind of neurodegenerative disorder in the past and patients with mental retardation were also excluded from the study.

Methodology:
Patients reported in the department of ENT with clinical and radiological evidence of fracture temporal bone are included in the study. A written informed consent was obtained. Inclusion criteria and exclusion criteria will be validated during history taking and physical examination. The principal investigator will be taking pertinent history from the patients recruited in the study on an individual basis. The physical examination included general examination and ENT evaluation with emphasis on otological examination. Otological examination involved assessing for any abnormality in the external auditory canal and the middle ear. In patients with clinical findings of fracture temporal bone CT scan will be done to confirm the diagnosis and also to rule out other head injuries. PTA and tympanometry to evaluate the degree and type of hearing loss has to be done in all cases.

CT scan of head along with HRCT temporal bone to assess the type and sites of fracture. Patient will be reassessed after a period of 2 months to assess the permanent hearing loss.

Data Analysis:

Data collected from each patient was entered in to an excel sheet after coding of variables and appropriate analysis was done with the help of SPSS 16.

OBSERVATION AND RESULTS:

Regarding the age distribution of patients in our study,

Age in years	Cases	Percentage
<20	1	2
21-30	18	35.3
31-40	15	29.4
41-50	3	5.9
>50	14	27.4
Total	51	100

About the sex distribution of cases,

Sex	Cases	Percentage
Male	47	92
Female	4	8
Total	51	100

Causes of temporal bone fracture in our study:

Mode of injury	Cases	Percentage
RTA	39	76.5
Fall	10	19.5
Assault	2	4
Total	51	100

The above data shows 76.5% percentage of cases in this study cause of injury is RTA, 19.5 % due to fall and 4% due to assault.

Distribution of cases based on type of fracture,

Type of fracture	Cases	Percentage
Longitudinal	39	76.5
Transverse	9	17.6
Mixed	3	5.9
Total	51	100

Type of hearing loss in our study group:

Types of hearing loss	Cases	Percentage
No hearing loss	6	11.7
Conductive	22	43.1
Sensory neural	5	10
Mixed	18	35.2
Total cases with hearing loss	45	88

Most common type of hearing loss noticed in this study was conductive in nature in 43.1% of cases, followed by 35.2% of mixed hearing loss and 10% of sensory neural deafness. Normal hearing was there in 11.7% of cases.

Regarding the distribution of cases based on degree of hearing loss.

Degree of hearing loss	Cases	Percentage
Normal	6	11.7
Mild hearing loss	15	29.4
Moderate hearing loss	14	27
Moderately severe hearing loss	12	24
Severe hearing loss	1	2
Profound hearing loss	3	5.9
Total	51	100

About the degree of hearing and types of fracture,

Degree of hearing loss	Longitudinal fracture	Transverse fracture	Mixed fracture
Normal	6(11.7%)	0	0
Mild hearing loss	14(27.45%)	1(1.95%)	0
Moderate hearing loss	12(24%)	1(1.95%)	1(1.95%)
Moderately severe hearing loss	6(11.7%)	5(9.8%)	1(1.95%)
Severe hearing loss	0	1(1.95)	0
Profound hearing loss	1(1.95%)	2(3.9%)	0

Longitudinal fracture has 6(11.7%) of normal hearing, 14(27.45%) mild hearing loss, 12(24%) moderate hearing loss, 6(11.7%) moderately severe hearing loss and one (1.95%) profound hearing loss. Transverse fracture has 1(1.95%) mild hearing loss, 1(1.95%) moderate hearing loss, 5(9.8%) moderately severe hearing loss, 1(1.95%) severe hearing loss, 2(3.9%) profound hearing loss. Mixed fracture produced 1(1.95%) moderate hearing loss and 1(1.95%) moderately severe hearing loss.

Tympanogram findings:

Tympanogram	Cases	Percentage
A curve	29	57
Ad curve	14	27
As	2	4
C	1	2
B	5	10

Based on tympanometry conducted in temporal bone fracture 57% of cases have A curve,27% of Ad curve ,4% of As curve ,2% of C curve and 10% of B curve.

Prognosis of hearing after 2 months:

Type of hearing loss	Cases	Improved after 2 months	percentage
Conductive	22	20	91
Sensory neural	5	1	20
Mixed	18	10	55.5
Total	45	31	69

Above data shows that in this study 91% of conductive hearing loss improved after two months, 55.5% mixed hearing loss and 20% of sensory neural hearing loss also improved on follow up. In total 69% of patients had improvement after a period of 2 months.

DISCUSSION:

This study conducted in 51cases of radiologically proven fracture temporal bone presented in Government Medical College Thrissur during the period of one year (2017-2018).The results and observations of the above study have been interpreted and discussed as follows.

In the present study of 51 patients age group varied from 13-67 years, majority of cases were in 21-30 age group (36%), and 31-40 age group(29%). Only 1 case (2%) below the age of 20. The mean age was 38.69.Regarding the sex distribution, out of 51 cases 47 (92.2%) were males and 4 (7.8) were females. In a study conducted by Ishman et.al[2] and Dahiya et.al[3] in gender distribution and site of involvement of temporal bone fracture, observed the same fact that males involved more than females.

RTA was the commonest cause of fracture temporal bone , 76.5% in our study;comparable to the study conducted by Brodie et.al in California (around 75%)[4] . This is due to the high incidence of RTA in our country.

The most common type of fracture in our study was longitudinal type of fracture (76%), followed by transverse fracture (15%), and mixed fracture(7%).Z Amin et.al[5] in their study found that 67.4% of longitudinal fractures 8.7% of transverse fracture and 13% of mixed fractures. In the study conducted by Saurabh Varshny and Nithin Gupta in Deradun[6] they observed that 50% longitudinal, 10 % of transverse and 30% of oblique and mixed fractures..Ishmanet.al[2] in their study conducted in 196 cases reported 99(64%) longitudinal fracture, and 36(23%) of transverse fracture .The traditional classification system involves classification of fracture in relation to the long axis of petrous temporal bone that is the longitudinal and transverse fractures.A new system of classification takes into account the status of otic capsule ie, otic capsule violating and otic capsule sparing fractures. Here we followed the traditional classification system. The type of fracture determined by HRCT of temporal bone along with CT head.

Assessment of hearing was done by PTA and tympanometry. Out of 51 cases 45 of them showed hearing loss. Most common type hearing loss is conductive type 43.1% ,followed by mixed hearing loss 35.2% , 10% cases of sensory neural hearing loss, no hearing loss in 11.7% of cases. In the study conducted by Lyos et.a[7].noticed conductive hearing loss are common in temporal bone fractures because of the presence of blood and clots in EAC, disruption of ossicles or perforation of tympanic membrane. Transverse fracture often cause immediate

SNHL since the fracture violate the otic capsule. In our study longitudinal fracture cases had maximum number of conductive hearing loss(20), 2 SNHL, 11 cases of mixed hearing loss. Transverse fracture cases had 5 mixed hearing loss, 3 SNHL, and 1 COHL. Mixed fracture caused 2 mixed hearing loss and one COHL.

On analyzing the degree of hearing loss it is found that mild hearing loss in 15(29.4%) of cases, moderate hearing loss in 14(27.4%) cases and moderately severe hearing loss in 12(23.5%) of cases, profound hearing loss in 3(5.9%) and severe hearing loss in 1(1.95%) cases. On analyzing degree of hearing loss in different types of fracture temporal bone, it revealed that longitudinal fracture has 6(11.7%) of normal hearing, 14(27.45%) mild hearing loss, 12(24%) moderate hearing loss, 6(11.7%) moderately severe hearing loss and one (1.9%) profound hearing loss. Transverse fracture has 1(1.9%) mild hearing loss, 1(1.9%) moderate hearing loss, 5(9.8%) moderately severe hearing loss, 1(1.9%) severe hearing loss, 2(3.9%) profound hearing loss. Mixed fracture produced 1(1.9%) moderate hearing loss and 1(1.9%) moderately severe hearing loss.

Tympanometry revealed 29(57%) of cases of A curve which is considered as normal, 14(27%) of Ad curve,which might be due to ossicular damages*(4),* As curve in 2(4%) of cases, Ccurve in 1(2%) of cases, B curve due to middle ear fluid in 5(10%) of cases. Hugh OBarber[8] in a similar study in 42 cases 10 were mild, 4 moderate, 8 moderately severe hearing loss.

The main observation of this study is that the prognosis of hearing after 2 months is very much noticeable. Out of 45 cases with hearing loss 31cases (69 %) showed improvement after 2 months. In this 90% of COHL, 55% mixed hearing loss and 20% SNHL showed improvement. After 2 months PTA showed a significant improvement in hearing such that 22(43.1%) cases came to normal degree of hearing. Hence 13 cases with initial hearing loss came to normal degree of hearing after 2 months. This might be due to the resolution of blood,clots or haemotympanum[9]. Sensory neural hearing loss had the least hearing improvement after 2 months, may be due to permanent neuronal injuries.

CONCLUSION:

Based on this study conducted in 51 cases of fracture temporal bone the main conclusions are that, longitudinal type of temporal bone fracture is the commonest followed by transverse fracture and mixed fracture respectively. Commonest type of hearing loss in our study was conductive hearing loss followed by mixed hearing loss and sensory neural hearing loss respectively. Majority of our patients showed significant improvement in hearing after 2 months. Patients with conductive hearing loss showed maximum improvement followed by patients with mixed hearing loss. Patients with sensory neural hearing loss had only minimal improvement.

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