

Evaluation of Loss of the Chorda Tympani Function in Middle Ear Disease

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Abstract: The Chorda Tympani Nerve (Branch Of Cn Vii, The Facial Nerve) Travels Through The Middle Ear Where It Is Very Vulnerable To Damage In Middle Ear Disease. There Are Many Studies Reporting Ctn Function Alteration After Middle Ear Surgeries But Very Few Reports On The Effect Of Middle Ear Disease On Ctn Prior To Surgery. Our Study Aims To Assess The Ctn Function By Examining The Type And Severity Of Gustatory Alteration In Patients With Middle Ear Disease And To Find Out Any Relation Of Ctn Dysfunction With The Duration And Type Of Csom. This Study Was Conducted In Patients With Chronic Middle Ear Disease Attending Opd In Department Of Otorhinolaryngology In A Period Of One Year. A Total Of 125 Cases With Chronic Middle Ear Disease Were Included In The Study. Gustatory Function Was Evaluated Using Solutions Of Different Concentrations Of Salt, Sweet, Bitter And Sour And Scored Using Scale Of 0 To 16. The Scores Were Statistically Analysed And Compared With Appropriately Matched Control Group. 56% Of Cases Showed Taste Dysfunction Whereas Only 27% Of Controls Had Mild Dysgeusia. The Mean Score Of Cases Is 11.8 And Mean Score Of Controls Is 13.7 And The P Value Is <0.0001 Which Is Considered Significant, However, The Mean Score Of Squamous Disease Is 12, Mean Score Of Mucosal Disease Is 15.3 And P Value Is 0.3781 Which Is Not Significant. Hence It Can Be Concluded That Patients With Chronic Middle Ear Disease Have Reduced Taste Sensation When Compared To Normal Individuals But We Could Not Find Any Relationship Of Gustatory Dysfunction With The Type Of Disease.

Date of Submission: 14-04-2018

Date of acceptance: 02-05-2018

I. Introduction

Chorda Tympani Nerve Is A Branch Of Seventh Cranial Nerve, The Facial Nerve. It Carries Two Types Of Fibres Via The Lingual Nerve. First, Special Sensory Fibres For Taste Sensation From Anterior Two-Thirds Of The Tongue And Second, Preganglionic Parasympathetic Fibers To Submandibular Ganglion Which Supply Submandibular And Sublingual Salivary Glands. Chorda Tympani Is One Of The Three Cranial Nerves Which Carry Taste Fibres From The Anterior Two-Thirds Of Tongue. Chorda Tympani Nerve Exits The Skull Through The Internal Acoustic Meatus, Then It Passes Through The Middle Ear From Posterior To Anterior Across The Tympanic Membrane Between The Malleus And Incus. Then It Runs Through The Petrotympanic Fissure And Infratemporal Fossa To Join The Lingual Nerve. The Chorda Tympani Nerve When Runs Within The Middle Ear, It Lacks A Bony Covering Which Makes It Vulnerable To Damage During Middle Ear Surgeries Or In Middle Ear Diseases Itself. There Are Many Studies On Loss Of Chorda Tympani Nerve Function After Middle Ear Surgeries But A Very Few Authors Have Reported Damage To Chorda Tympani Nerve Due To Middle Ear Diseases Itself Prior To Surgery. Vlasto, In 1930, Reported Gustatory Alteration In Middle Ear Diseases. Ho And Arnold Also Described Similar Findings In Their Studies. But After That Very Few Studies Have Been Reported On This Topic. We Have Conducted A Study To Evaluate The Loss Of Chorda Tympani Nerve Function In Middle Ear Diseases.

II. Aims And Objectives

1. To Assess The Ctn Function By Examining The Type And Severity Of Gustatory Alteration In Patients With Middle Ear Disease.
2. To Find Out Any Relation Of Ctn Dysfunction With The Duration And Type Of Csom.

III. Materials And Methods

This Cross-Sectional Study Was Carried Out On Patients Attending Department Of Otorhinolaryngology At Silchar Medical College And Hospital, Silchar, Assam From March 2015 To March 2016. A Total Of 125 Cases Of Chronic Middle Ear Disease Were Included In The Study With Equal Number Of Controls.

- **Study Design** : Cross – Sectional Study
- **Place Of Study** : Department Of Ent, Smch, Silchar
- **Duration Of Study** : One Year

Inclusion Criteria :

- Patients Of Both Genders, Above 12 Years Of Age Presenting With chronic Middle Ear Disease.

Exclusion Criteria :

- Patients Who Had Ear Surgeries Previously
- Patients With History Of Facial Nerve Palsy
- Patients Having Any Tongue Disease
- Patients Taking Any Drugs Which Can Alter Taste
- Patients With Any Systemic Illness Which Can Affect Taste Perception.

Procedure :

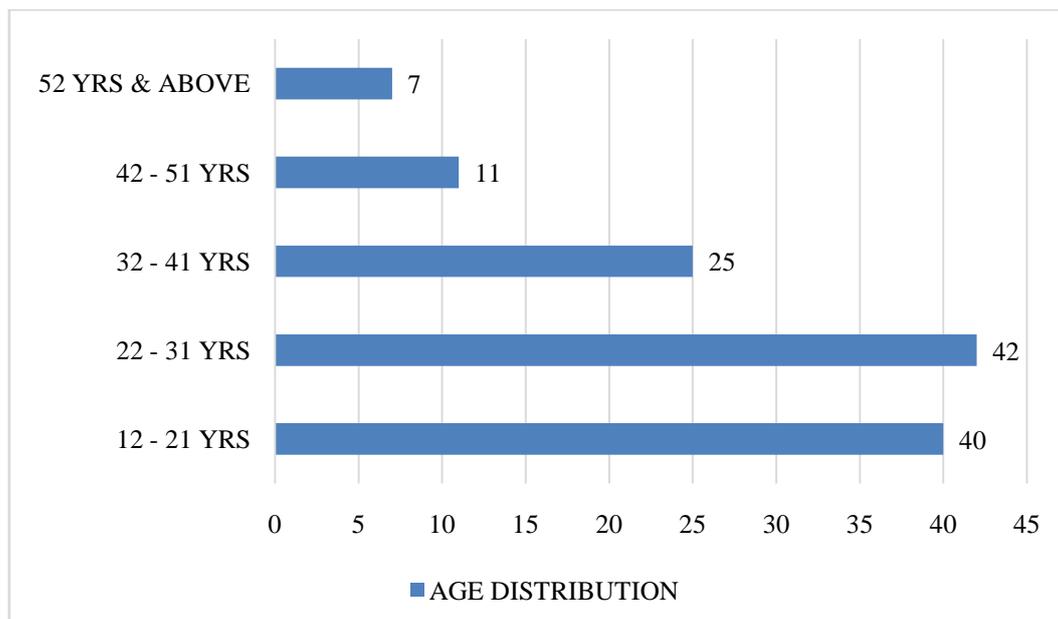
The Taste Test Was Conducted Using Solutions Of Different Concentrations Of Four Basic Tastes – Sweet, Salt, Sour And Bitter. The Concentrations Were: Sour -Citric Acid 0.3 G/MI, 0.165 G/MI, 0.09 G/MI, And 0.05 G/MI; Bitter - Quinine Sulphate 0.006 G/MI, 0.0024 G/MI, 0.0009 G/MI And 0.0004 G/MI; Sweet sucrose 0.4 G/MI, 0.2 G/MI, 0.1 G/MI And 0.05g/MI; Salt-Sodium Chloride 0.25g/MI, 0.1 G/MI, 0.04 G/MI And 0.016G/MI. Patients Fulfilling Inclusion And Exclusion Criteria Were Selected And Informed About The Test To Be Conducted. They Were Asked Not To Take Any Food Or Drink 1 Hour Before The Test. They Were Instructed To Rinse Their Mouth With Clean Water Just Before Starting The Test. Test Was Done By Applying A Drop Of Test Solution On The Anterior Twothird Of Tongue And The Patient Was Asked Whether They Had Experienced Sweet, Salty, Sour Or Bitter Taste. The Test Was Done Using Solutions Proceeding From Low Concentration To A High Concentration And After Each Solution Patient Was Asked To Rinse His Mouth With Water. Finally Scoring Was Done. Each Solution Carries 1, So Total Score Is 16. Patients Were Given Scores On The Basis Of Number Of Solutions Correctly Identified. Based On The Scores, Patients Were Divided Into Grades Like Grade 0/Profound Dysgeusia (Score 0-3), Grade 1/Severe Dysgeusia (Score 4-8), Grade 2/Moderate Dysgeusia (Score 9-11) And Grade 3/Mild Dysgeusia (Score 12-16). Besides The Test, A Brief History Of The Disease Was Taken From Every Patient.

Statistical Analysis :

Continuous Data Were Expressed As Mean (Sd) Or As Mean (Range). Categorical Data Were Expressed As Percentages. Data Were Tabulated In 2x2 Contingency Tables And Statistical Tests Were Applied To Calculate Mean Scores. Data Were Analyzed Using The In Stat Software. Chi Square Test Was Used For Analysis. P Values <0.05 Was Considered Statistically Significant.

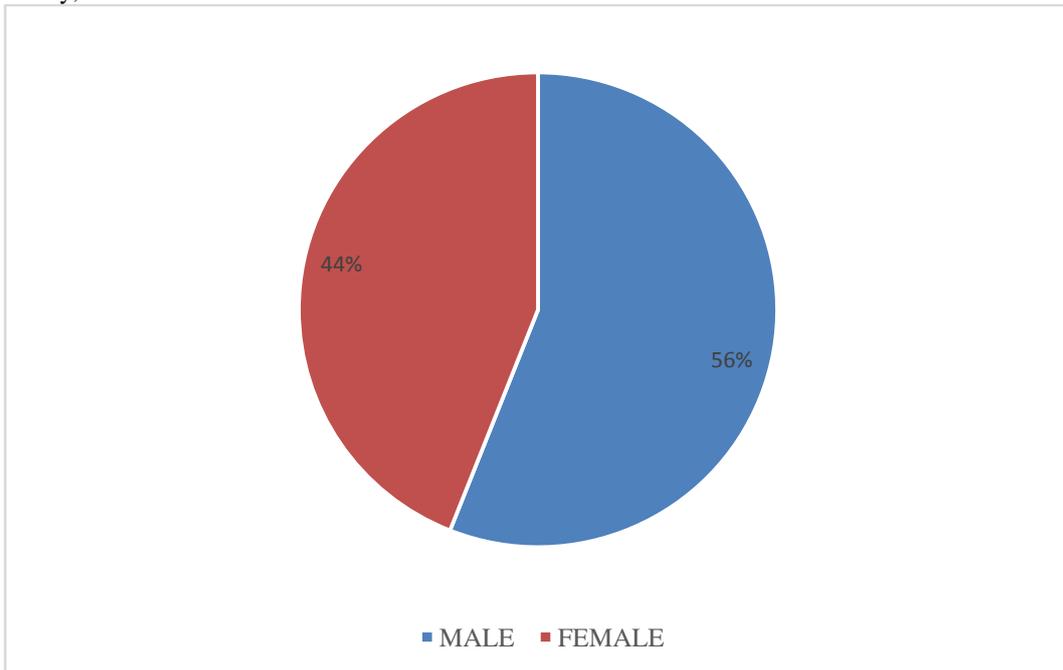
IV. Results

In Our Study Of 125 Patients, We Divided Them According To Age Such As 40 Cases Within 12 – 21 Yrs, 42 Cases Within 22 – 31 Yrs, 25 Within 32 – 41 Yrs, 11 Within 42 – 51 yrs, 7 Cases Were Above 52 Yrs.



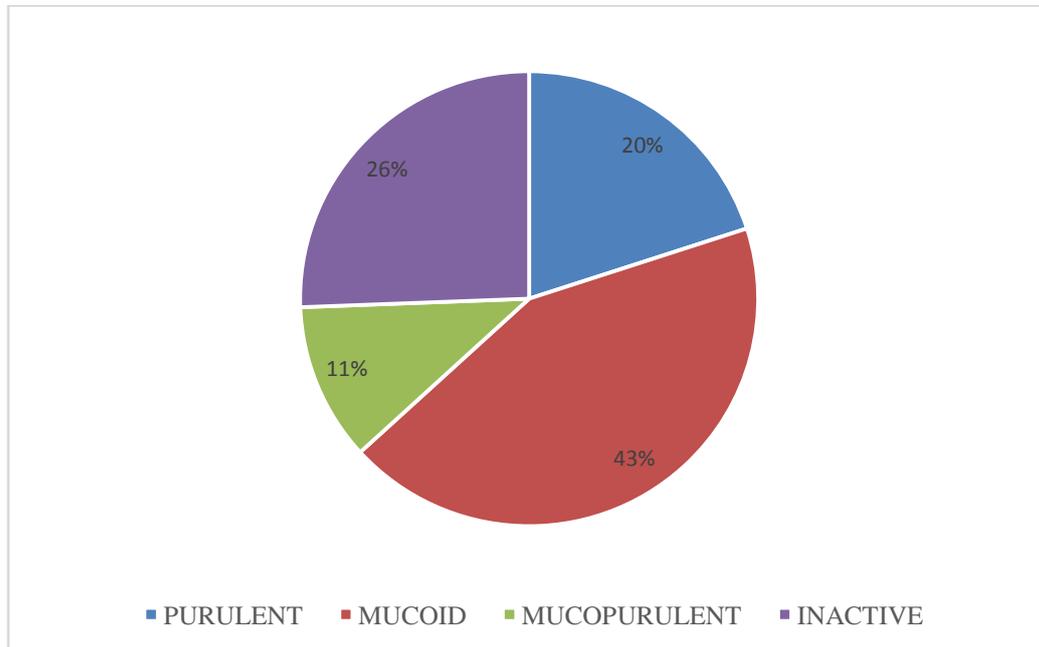
Bar Diagram Showing Age Distribution

In Our Study, 56% Were Male And 44% Female.



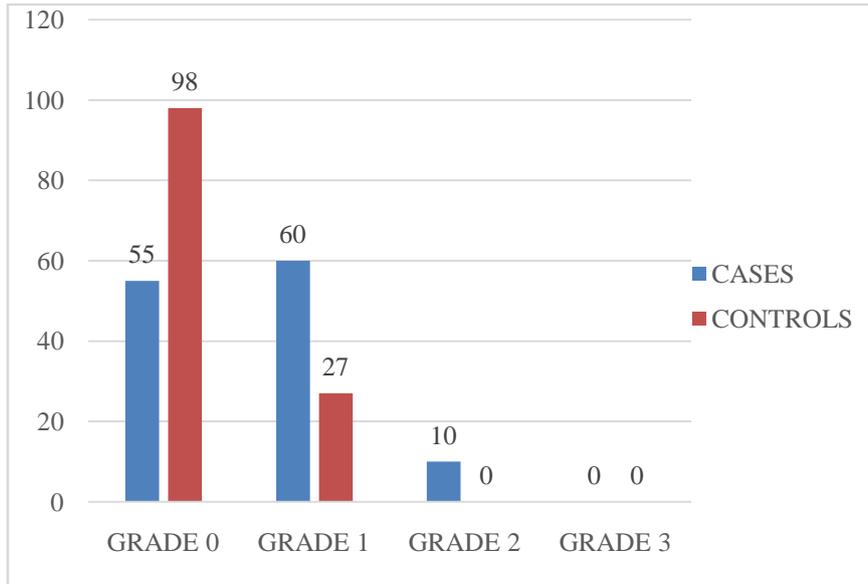
Pie Diagram Showing Sex Distribution

In Our Study Of 125 Cases, 43.2% Of Patients Came With Muroid Discharge, 11.2% With Mucopurulent Discharge, 20% With Purulent Discharge And 25.6% Were Inactive.

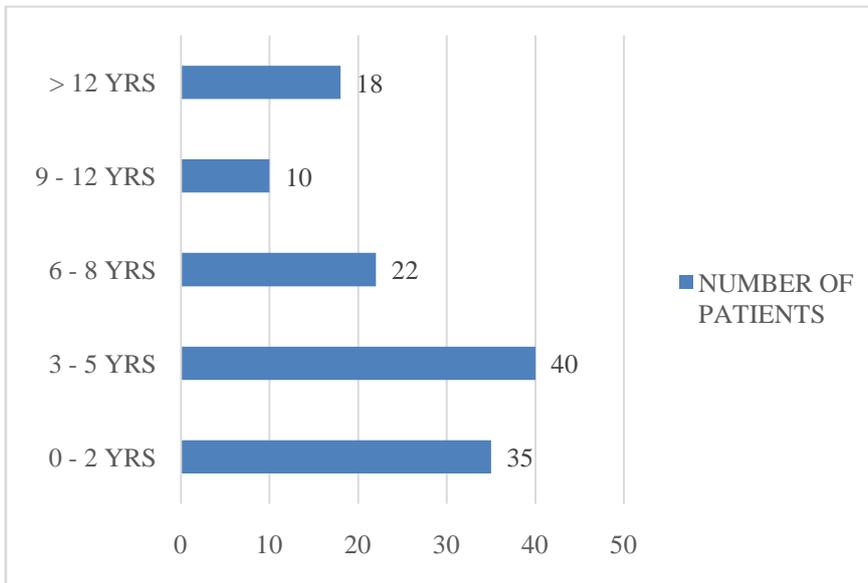


Pie Diagram Showing Types Of Discharge

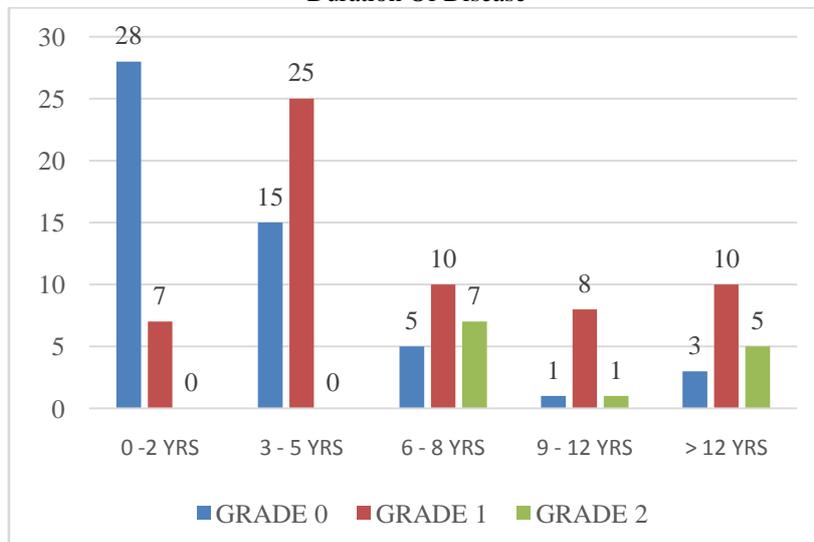
Out Of Total 125 Cases Of Com The Commonest Taste Dysfunction Noted Was Mild Dysgeusia (48% Of Cases,60) Followed By Moderate Dysgeusia (8% Of Cases,10).No Loss Of Taste Sensation Was Observed In 44%(55) Of Patients.Whereas Out Of 125 Controls 78.4% (98)Showednormaltaste Sensation And 21.6(27)% Showed Mild Dysgeusia.



Patients Presenting With Different Grades Of Taste Dysfunction

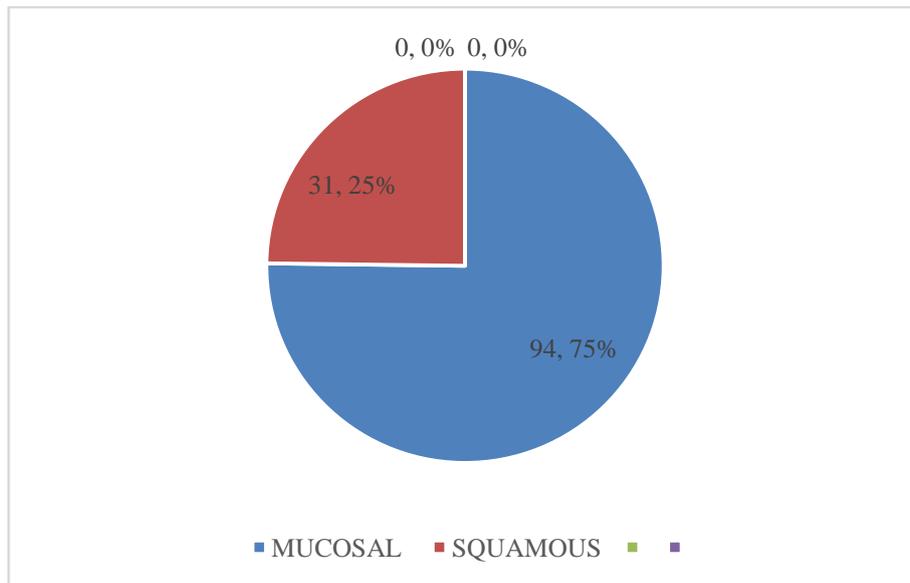


Duration Of Disease



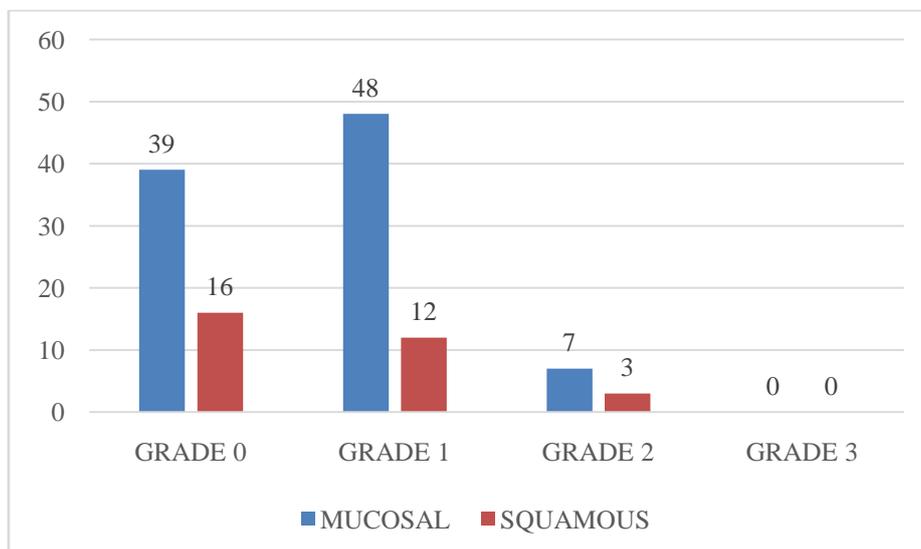
Relation Between Duration Of Disease And Taste Dysfunction

In This Study Out Of 125 Cases 24.8% (31 Patients) Presented With Chronic Otitis Media Squamous Type. 75.2% (94 Patients) Presented With Chronic Otitis Media Mucosal Type.



Number Of Patients With Squamous Disease And Mucosal Disease

On Evaluating The Type Of Disease With Taste Dysfunction We Did Not Observe Any Difference Between Squamous And Mucosal Type Of Com (Mean Score Of Squamous=12, Mean Score Of Mucosal=15.3, P Value=0.3781 Considered Not Significant). However The Mean Score Of Cases Is 11.8 And Mean Score Of Controls Is 13.7 And The P Value Is <0.0001 Which Is Considered Significant. It Implies That Patients With Chronic Middle Ear Disease Have Significant Loss Of Taste Sensation Compared To Normal Individuals.



Taste Dysfunction Of Patients With Mucosal And Squamous Disease

V. Discussion

In Our Study Of 125 Patients, We Divided Them According To Age Such As 40 Cases Within 12 – 21 Yrs, 42 Cases Within 22 – 31 Yrs, 25 Within 32 – 41 Yrs, 11 Within 42 – 51 yrs, 7 Cases Were Above 52 Yrs. Similarly Kumara Et Al. Found 41.4% In Age Group 11 – 20 Years, 30.8% In 21 – 30 Years And 8.5% In 31 – 40 Years.¹

In Our Study We Found That 56% Of Our Patients Were Male And 44% Female Like Kumara Et Al. Whose Study Showed Sex Incidence Of 59.5% Male And 40.5% Female¹. Study Conducted In Singapore², Pakistan³, Iran And Other Parts Of India⁴ Gave The Similar Results.

This Study Found 56% Of Cases With Chronic Middle Ear Disease Had Taste Dysfunction Whereas Only 27% Of Controls Showed Mild Dysgeusia. Similarly Landis Et Al. Also Proved In Their Study That Taste Function Changes In Relation To Chronic Middle Ear Disease.⁵

We Also Observed Increase In Grade Of Dysgeusia With Increase In The Duration Of Disease . This May Be Explained By The Fact That The Chorda Tympani Nerve Remains Exposed And The Effects Of The Toxin Of Purulent Discharge Is For A Prolonged Duration. Similarly Felipe Et Al. Also Reported Worsening Of Gustatory Function With Increased Duration Of Disease.⁶ However, Sano Et Al., In Their Study, Did Not Find Any Such Relationship.⁷

In The Present Study Out Of 125 Cases 24.8% (31 Patients) Presented With Chronic Otitis Media Squamous Type And 75.2% (94 Patients) Presented With Chronic Otitis Media Mucosal Type. The Mean Score Of Patients With Squamous Disease Showing Taste Dysfunction Is 12 And The Mean Score Of Patients With Mucosal Disease Showing Dysgeusia Is 15.3. So The P Value Is 0.3781 Which Is Considered Not Significant. It Implies That There Is No Difference In Change In Taste Sensation In Squamous And Mucosal Type Of Case. Similarly Sano Et Al. Did Not Find Any Relationship Between Type Of Disease And Gustatory Alteration.⁷ However, Felipe Et Al.⁶ And Landis Et Al.⁵ Reported Worsening Of Taste Sensation In Squamous Type Of Disease.

The Gustatory Test Technique Used In Our Study Was Solutions Of Different Concentrations Of Four Basic Tastes, Similarly Felipe Et Al. And Landis Et Al. Used Natural Tastes But With Filter Paper Strips. However, Sano Et Al. Used Electrogustometry To Test The Chorda Tympani Nerve Function. Although The Electrogustometry Technique Is Easier To Perform, It Produces Predominantly Metallic Tastes, And Not The Natural Tastes. Moreover , There Is A Possibility Of Co-Stimulation Of Trigeminal Nerve Fibres Through The Electrical Stimuli.

VI. Conclusion

After Observing The Data Obtained In Our Study, We Conclude That Patients With Chronic Middle Ear Disease Have Reduced Taste Sensation When Compared To Normal Individuals. This Proves Loss Of Chorda Tympani Nerve Function In Patients With Chronic Middle Ear Disease. The Data In This Study Also Shows That Patients With Longer Duration Of Disease Have More Gustatory Dysfunction Than Patients With Shorter Duration Of Disease. But It Could Not Find Any Relationship Of Gustatory Dysfunction With The Type Of Disease.

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"IOSR Journal of Dental and Medical Sciences (IOSR-JDMS), vol. 17, no. 4, 2018, pp 03-08."