"IMPACT OF AGE OF THE PATIENT ON THE OUTCOME OF TYMPANOPLASTY IN ADULT POPULATION – A PROSPECTIVE OBSERVATIONAL STUDY AT KLE'S DR. PRABHAKAR KORE HOSPITAL AND MEDICAL RESEARCH CENTRE."

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ABSTRACT

Background: Tympanoplasty is the surgical treatment of Chronic Otitis Media and it aims to eradicate the middle ear disease and provide better hearing to the patient. 'Does age of the patient impact the outcome of tympanoplasty?' is a valid question concerning every otologist. The result of this study will guide the surgeons and the patients to know the probable hearing gain at different age groups after performing tympanoplasty.

Objective: To determine if age of the patient is a factor influencing the success rate of Tympanoplasty based on the following parameters:-

- Graft Uptake
- Post operative Hearing gain

Materials and Methods: A prospective observational study was conducted on 44 patients who underwent Tympanoplasty for a dry central perforation with conductive hearing loss. The post-operative PTA was repeated three months after the surgery and was compared with the pre-operative PTA. The status of graft uptake was checked 3 months post-operatively.

Results: It was observed the hearing gain was maximum when the age of the patient is between 18-35 years and gradually decreased as the age of the patient increased to 36-50 years and was the least when the age of the patient was between 50-65 years. The graft failure rate was the least in the age group of 18-35 years and increased when the age of the patient was 36-50 years. The graft failure was the highest in patients over 50 years of age.

Conclusion: All cases show noticeable increase in hearing improvement following tympanoplasty. However, with advancing age of the patient the post-operative hearing improvement decreased. The graft uptake was higher in the older patients than the younger patients. Thus, ‘age of the patient’ impacts the success rate of tympanoplasty.

LIST OF ABBREVIATIONS

GLOSSARY	ABBREVIATIONS
dB	Decibel
HL	Hearing loss
PTA	Pure Tone Audiometry
AC	Air conduction
BC	Bone Conduction
CHL	Conductive Hearing loss
A-B gap	Air – Bone gap
MHL	Mixed Hearing loss
ANSD	Auditory neuropathy spectrum disorder
Min	Minimum
Max	Maximum
SD	Standard Deviation
HS	Highly Significant
NS	Non Significant

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INTRODUCTION

Chronic Otitis Media is a disease that alters the normal physiological and anatomical functioning of the middle ear cavity and the tympanic membrane, typically presenting as ear discharge and a decline in hearing potential of the affected ear. It usually affects people of low socio-economic status who receive inadequate medical attention.[1]

World Health Organisation estimates that around 65-330 million individuals suffer from Chronic Otitis Media worldwide out of which half of the population suffers from hearing loss.[2]

The estimated average annual incidence of new cases of Chronic Otitis Media is 31 million.[3]

In India, Chronic Otitis Media is a commonly seen middle ear disease with a prevalence of 7.8%.[4]

If the ailment is not controlled at time then it can have serious health implications including intracranial complications, thus making Chronic Otitis Media a major public health issue that requires necessary measures to curb its prevalence worldwide.[5]

Tympanoplasty is the surgical intervention of Chronic Otitis Media aimed at remedying the conductive form of deafness. Reconstructing the middle ear cavity and the sound transmission system, it intends to remove the illness from the middle ear cleft while enhancing the hearing mechanism. The primary goal of Tympanoplasty is to eradicate the disease in the middle ear to improve hearing and to establish ventilation of the middle ear cleft.[6]

Numerous academic works discuss the efficacy rate for tympanoplasty. Studies done in the past report a success rate of 60-99% in adults and 35- 94% in children.[7,8]

Whether age plays a vital role in deciding the outcome of tympanoplasty remains a debatable point since many years. Studies done in the past talk regarding various factors that affect the success rate of tympanoplasty, but very few studies talk about 'age of the patient' as the sole factor in predicting the efficacy of the surgery. According to Bocca, age of the patient is an inevitable component in unsuccessful tympanoplasties, as nearly all his cases done for patients over the age of 50 years turned out to be functional failures.[9] Similarly, Siirala et al. found better results in the adult age group of 30 to 60 years but the results were poor among patients younger than 30 years and older than 60 years.[10]

However, in recent times studies exclusively considering 'age of the patient' are not on the records and thus the study was intended keeping only 'age of the patient' as the only variable into consideration. So, for different age groups considered for tympanoplasty, 'How much hearing improvement can be expected ?' is a valid question that a patient can ask and the answer to which is something that every operating surgeon should be aware about. Based on the patient's age, the study's findings should enable us to counsel patients on the anticipated outcomes after surgery.

OBJECTIVE OF THE STUDY

The objective of this study is to determine if age of the patient is a factor influencing success rate of Tympanoplasty based on following parameters:-

- Graft uptake
- Post operative Hearing gain

REVIEW OF LITERATURE

Anatomy of the Middle Ear

Human Ear is broadly divided into three anatomical divisions, namely external ear, middle ear and the inner ear.

The tympanic membrane is a trilaminar structure which acts as a barrier between the external ear and the middle ear. Comprising a squamous epithelial layer on its lateral surface and a mucosal extension of the middle ear mucosa on its inner surface, it is separated by a middle fibrous layer. Characterized by a length of 9-10 mm, the tympanic membrane showcases a horizontal width of 8-9 mm and a thickness of roughly 0.1mm.

The inclination of the tympanic membrane is oriented obliquely, positioned at an angle of 140 degrees relative to the superior wall of the external auditory canal, and approximately 55 degrees with the floor of the external auditory canal. This results in the posterosuperior wall of the external auditory canal measuring around 25 mm in length, while the anteroinferior wall of the external auditory canal is approximately 31 mm in length.

The tympanic membrane consists of pars flaccida and pars tensa. Positioned superiorly, the pars flaccida constitutes a thin and lax area of the tympanic membrane that lacks the middle fibrous layer, rendering it the weakest portion of the membrane. The umbo refers to the fictional point at the end of the handle of malleus. The pars tensa is additionally segmented into four quadrants by two lines: one that runs parallel to the handle's long axis and the other that intersects the first line at the umbo, resulting in the antero-superior quadrant, antero-inferior quadrant, postero-superior quadrant, and postero-inferior quadrant.[11]

The middle ear cavity is a non-uniform, obliquely positioned, narrow space located within the temporal bone. Vertically along its antero-posterior axis, it has a length of 15 mm. The width shifts, with a measurement of 2 mm at its narrowest point, 4 mm towards the bottom, and 6 mm towards the top.

The thin osseous structure known as the tegmen tympani separates the middle ear cavity from the middle cranial fossa, thus constituting the roof of the middle ear. A slender plate of the temporal bone separates the middle ear from the superior bulb of the internal jugular vein, serving as the floor.

The uppermost part of the anterior wall of the middle ear houses the canal for the tensor tympani muscle, while the eustachian tube opens in the middle section. The inferior part of this wall consists of a thin bone plate that separates the middle ear from the internal carotid artery.

The medial wall of the middle ear displays a rounded bulge of the basal turn of the cochlea, termed the promontory, which is impressed by the tympanic plexus of the glossopharyngeal nerve. Below the promontory lies the round window, with the oval window positioned superiorly. The canal for the facial nerve runs posteriorly just above the oval window, descending behind the posterior wall of the middle ear to terminate at the stylomastoid foramen. The lateral semicircular canal's prominence is located above the facial nerve canal. Sinus tympani, a depression on the medial wall of the middle ear, is characterized by the ponticulus superiorly, the subiculum inferiorly, the vertical segment of the facial nerve laterally, and the posterior semicircular canal medially.[11]

The posterior wall of the middle ear features an opening superiorly, known as the aditus, facilitating communication between the epitympanic recess and the

tympanic antrum. At the point where the posterior and medial walls meet, there exists a conical projection referred to as the pyramid, with an opening at its apex for the tendon of the stapedius muscle. Situated on the posterior wall next to the pyramid, is the posterior canaliculus for the chorda tympani nerve, allowing the nerve to enter the middle ear.

The contents of the middle ear include three ossicles namely malleus, incus, and stapes, two muscles namely the tensor tympani and the stapedius, ligaments of the ear ossicles, vessels supplying the middle ear, two nerves namely chorda tympani and tympanic plexus and air.

The ossicular chain conducts sound from the tympanic membrane to the cochlea. The lateral process of the malleus has a cartilaginous cap that merges with the pars propria of the tympanic membrane. When performing tympanoplasty, it is suggested to execute a sharp dissection of the cartilaginous cap of the lateral process of the malleus from the pars propria of the tympanic membrane rather than using blunt dissection. Among the three ossicles of the middle ear, the incus holds the distinction of being the largest. Owing to its delicate blood supply, the long process of the incus is particularly susceptible to osteitic resorption in cases of chronic otitis media. In contrast, the stapes is the smallest of the three ossicles, with its footplate positioned atop the oval window and encircled by the stapediovestibular ligament.[11]

The eustachian tube is 36 mm in length is abundantly lined by mucociliary cells. The tube is responsible for the ventilation of the middle ear, During rest the tube is closed. The tensor veli palatini muscle is responsible for the opening of the tube.

The tympanic cavity, mastoid air cells, and the medial surface of the tympanic membrane are all encompassed by mucosa, indicating their shared origin from the

tubotympanic recess. Within the promontory, hypotympanum, and epitympanum, ciliated cells coexist with secretory cells, forming mucociliary tracts that synergistically interact with the mucociliary clearance system of the eustachian tube.

Physiology of Hearing

The middle ear is accountable for achieving impedance matching between the air in the external auditory canal and the fluids in the cochlea, while also ensuring the preservation of the phase discrepancy between the oval and round windows.

The arrangement of fibres in the middle fibrous layer of the tympanic membrane is intricate, allowing for the membrane to buckle in response to auditory stimuli. This mechanism facilitates impedance matching by absorbing sound in the middle fibrous layer and transmitting it to the handle of the malleus, resulting in a fourfold increase in impedance value and enhanced force of transmission. Moreover, the intact tympanic membrane ensures the preferential conduction of sound to the oval window via the ossicular chain.[11]

The transformer mechanism of the middle ear ensures that the amplitude of sound transmitted from the tympanic membrane to the oval window is decreased while the vibrational force is proportionally increased. This is achieved through the lever ratio and the areal ratio mechanisms.

The lever ratio comprises the synchronized vibration of the malleus and incus, in which the handle of the malleus is lengthier than the long process of the incus at a ratio of 2.1:1, causing a 4.4 times increase in impedance. The areal ratio is centered on the disparity in surface area between the stapes footplate (3.2 mm^2) and the tympanic membrane (60 mm^2), resulting in an 18.75-fold increase in pressure on the footplate.

For effective movement of hair cells, the oval and round windows must vibrate in reciprocal phases. Sound primarily travels through the ossicles towards the oval window, with only a small portion entering the round window for pressure relief.

The ossicular coupling of the tympano-ossicular system transmits sound to the inner ear, causing sound pressure to accumulate in the middle ear canal from the movement of the tympanic membrane. The spatial division between the oval and round windows causes a minor detectable variation in sound pressure, which triggers the movement of labyrinthine fluid recognized as acoustic coupling.

The incudomalleal and incudostapedial joints between the ossicles enhance their flexibility, allowing them to withstand significant pressure differences across the eardrum and prevent damage. These connections also permit self-regulation of the ossicles, wherein the stapedius muscle primarily influences the stapes via the incudostapedial joint, and the tensor tympani muscle has a minimal effect on the malleus through the incudomalleal joint.[11]

Chronic Otitis Media

Chronic Otitis Media is characterized as an inflammatory condition affecting the middle ear cavity, leading to enduring alterations in the tympanic membrane such as atelectasis, dimer formation, perforation, retraction pocket formation, tympanosclerosis, and cholesteatoma, with or without affecting the ossicular chain. It is a result of long-term defective functioning of the eustachian tube with an inadequately ventilated middle ear space, repeated bouts of acute otitis media and persistent middle ear space infection.

Pseudomonas aeruginosa is the most typical bacterial isolate for Chronic Otitis Media. Aerobic organisms including Enteric gram-negative bacilli, Staphylococcus

aureus, Streptococci, Klebsiella pneumoniae and Haemophilus influenzae are among the other isolates. Peptostreptococcus and Bacteroides species are examples of anaerobic isolates causing foul-smelling ear discharge.

Chronic Otitis Media is classified as following:- [12]

- Chronic Active Otitis Media
    - With cholesteatoma
    - Without cholesteatoma
- Chronic Inactive Otitis Media
    - With Perforation
    - With Retraction pocket
    - With Adhesive otitis media
    - With ossicular chain fixation or resorption
- Chronic Inactive Otitis Media with frequent reactivation

Cholesteatoma is defined as a cystic mass covered by keratinizing stratified squamous epithelium and located on a fibrous stroma. As the cholesteatoma expands it comes in contact with the ossicles and the scutum, leading to release of inflammatory mediators leading to degeneration of the mucosal lining followed by increased osteoclastic activity at cellular level leading to bone erosion. Acquired type of cholesteatoma often present by retraction or perforation of the tympanic membrane with trapped squamous debris as seen on otoscopy. Since ossicular chain involvement is seen, patient presents with conductive type of hearing loss.

Active type of Chronic Otitis Media without cholesteatoma presents with chronic ear discharge of variable amount, colour and consistency. Otalgia is not severe and waxes and wanes throughout the course. Conductive type of hearing loss is

often present. It can persist indefinitely if no definite management is given to the patient. Pathologically, initially inflammation resulting in mucosal edema in the middle ear spaces is noticed. As condition advances, soft, friable granulation tissue is seen. If inflammation persists then aural polyps are formed from the hyperemic mucosa and can even fill up the middle ear space and prolapse through the perforated tympanic membrane to fill up the external auditory canal. With continued inflammation, mastoid air cell tracts get blocked and ossicular degeneration begins.

Chronic Inactive Otitis Media with perforation is a state characterized by the presence of a tympanic membrane perforation in the absence of any concurrent inflammatory response or microbial infection within the middle ear or mastoid. The perforation can be in the pars tensa or the pars flaccida and can be categorised as marginal, central, subtotal or total. Perforations can be surrounded by healthy residual tympanic membrane or by tympanosclerosis or by a dimeric membrane. There can be fibrous tissue proliferation in the middle fibrous layer of the membrane leading to thickening of the tympanic membrane at the periphery of the perforation. In some instances, epithelial cells migrate medially through the existing hole rather than stopping at the edge, although the the junction of the squamous epithelial layer of the tympanic membrane and the mucosa of the inner layer of the tympanic membrane is located at the edge of the perforation.

In cases of Chronic Inactive Otitis Media with retraction pocket, a segment of the tympanic membrane becomes retracted towards the middle ear or attic despite the resolution of acute inflammation. This retraction of the tympanic membrane is attributed to negative pressure in the middle ear, which arises from a blockage in the attic or from persistent dysfunction of the eustachian tube. Most common site for

formation of this pocket is the posterior quadrant and the attic. Retraction pockets are often precursors to cholesteatoma but not pathognomonic for cholesteatoma.

Chronic Inactive Otitis Media with adhesive otitis media presents a situation where there is a pronounced retraction of the tympanic membrane covering the promontory, ossicles, and other middle ear components, causing the tympanic membrane to remain in its retracted position despite negative insufflation attempts. The pathological changes involve thinning of the tympanic membrane and the loss of its lamina propria. Epidermization of the middle ear, an advanced manifestation of adhesive otitis media, involves the transformation of the typical mucosal lining of the middle ear into a squamous epithelial lining.

In Chronic Inactive Otitis Media with ossicular fixation or resorption the most vulnerable joint for resorption is the incudostapedial joint due to its tenuous blood supply to the lenticular process. However, resorption can also occur at long process of incus, capitulum and crura of stapes and manubrium of malleus.

Pure-Tone Audiometry:

An audiometer is a piece of technology that generates pure tones that can have their intensity changed in 5 dB steps. AC thresholds are commonly assessed at frequencies of 125, 250, 500, 1000, 2000, 4000, and 8000 Hz, while BC thresholds are evaluated for frequencies of 250, 500, 1000, 2000, and 4000 Hz. The level of hearing impairment at a specific frequency is ascertained based on the degree of intensity required to surpass the norm. This information is depicted on a visual chart referred to as an audiogram. Cochlear function is determined by the threshold of BC. The difference between the air and bone conduction thresholds, also known as A-B gap serves as gauge for the severity of the CHL.

It should be emphasised that the audiometer is calibrated in such a way that a normal person's hearing is at 0 dB for both bone conduction and air conduction, and there is no Air Bone gap, but tuning fork tests typically indicate AC > BC.

The better ear is masked to prevent receiving a shadow curve from the better ear not being tested when the difference between the two ears is 40 dB or higher in AC thresholds. In all studies of bone conduction, masking is crucial. By using narrowband noise to the non-test ear, masking is accomplished.

Pure Tone Audiometry Applications:

a) It measures the hearing threshold through bone and air conduction, indicating the kind and severity of Hearing Loss.
b) A document may be preserved for potential future use.
c) An audiogram will be necessary in order to prescribe hearing aids.
d) Assists in determining the degree of disability for medicolegal purposes.
e) Aids in predicting the threshold for speech reception.

Quantifying the effect of hearing loss:

Hearing loss is typically classified according to its severity: Mild Hearing Loss, Moderate Hearing Loss, Severe Hearing Loss, Profound Hearing Loss. The ranges between which the typical hearing threshold lies are known as these degrees. The British Society of Audiology's (2011) classifications, which are based on average of hearing thresholds for 250, 500, 1000, 2000, and 4000Hz and specify four categories:

• Mild Hearing Loss: 21–40dB

• Moderate Hearing Loss: 41–70dB

• Severe Hearing Loss: 71–95dB

• Profound Hearing Loss: 96dB and more

The necessity for a simple method of describing instances between experts or from a professional to a patient gave rise to classifications based on the typical degree of the Hearing Loss. However, for many numbers of reasons, they do not effectively convey effects of Hearing Loss. In first place, Hearing Loss frequently impacts hearing thresholds unevenly across frequencies for both right and left ear.[12]

Types of hearing loss:

Hearing Loss can be broadly divided into three types: Conductive Hearing Loss, Sensorineural Hearing Loss, Mixed Hearing Loss.

When there is difference of more than 10 dB between the AC and BC thresholds at any frequency, a hearing loss is categorised as "Conductive," which is regarded as a severe Air – Bone gap as described in the section above on measuring hearing thresholds. In cases of Conductive Hearing Loss, Bone Conduction thresholds are often at the normal-hearing levels.

A "mixed" HL is one in which the BC thresholds are elevated above 20 dBHL and the ABG is considerable.

Disruptions to the middle and/or external ear's transmission processes result in Conductive Hearing Loss. Conductive Hearing Loss, is brought on by conditions such as fluid in the middle ear or anomalies of the tympanic membrane or ossicles. When there is full audibility of signal, Conductive Hearing Loss results in a reduction in hearing sensitivity that may vary across frequencies, although most components of sound perception are normally unchanged. This indicates that hearing aid

amplification can effectively compensate for Conductive Hearing Loss. 60dB HL is typically accepted as upper limit of Conductive Hearing Loss.

Nevertheless, regardless of volume of the sound, the extent of the hearing loss attenuates all sounds equally, so overall auditory deprivation caused by Conductive Hearing Loss may be more than that caused by Sensorineural Hearing Loss. Children with Conductive Hearing Loss may perceive sound patterns inconsistently due to the fluctuating nature of their hearing loss, which reduces their chances of identifying well-known sound patterns. Conductive Hearing Loss is quite prevalent and can also be found alongside Sensorineural Hearing Loss based on the cochlea, leading to a Mixed Hearing Loss which is caused by the very high incidence of middle ear pathology in infants. Many Conductive Hearing Loss instances can be treated medically and surgically, occasionally with the prospect of hearing restoration. Hearing aids stimulating via AC or BC and BC hearing implants are available as treatments for permanent CHL or MHL. Loss of auditory function and Sensorineural Hearing Loss. Sensorineural Hearing Loss describes a dysfunction of cochlea and/or direct nerve connections. Severity of the Sensorineural Hearing Loss can vary from little to complete, and it is typically permanent. The word "neural" is only used in the phrase "sensorineural" to describe nerve connections that run from inner hair cells to auditory nerve. In contrast to ANSD, where neuronal firing may be reduced or out of synchronisation across nerve fibres, creating fluctuations and distortion in speech information, this is not a disorder of the auditory system.[12]

Research conducted by M. Tshifularo in the year 2022 has determined that age represents a statistically significant variable influencing the results of tympanoplasty. The graft uptake for younger age group was better than the elder age group.[13]

Denoyelle F et al. in 1999 asserted that the patient's age does not exert an influence on the surgical results of tympanoplasty.[14]

A study done by Albera et. al in 2006 on 212 patients, stated that age did not significantly affect the outcomes of tympanoplasty.[15]

Toss in his study in 1972 stated that patients in the age group of 11- 30 years showed good results in discharging and dry ear, the age group of 31-60 showed good results in dry ear but poor results in discharging ears. The age group of above 60 years showed worse results as compared to the other two groups.[16]

In a study done by John R. Emmett in 1999, he compared 2 age groups, 20-40 years and more than 65 years for the outcome of tympanoplasty and concluded that age is not a factor in the success or failure of healing after the surgery.[17]

MATERIALS AND METHODS

Source of Data: Patients visiting the Outpatient Department (OPD) of Otorhinolaryngology (ENT) and Head and Neck Surgery at KLE's Dr. Prabhakar Kore Hospital and Medical Research Centre in Belagavi diagnosed as case of Chronic Otitis Media, mucosal inactive type planned for Tympanoplasty without mastoidectomy.

Study Design: A hospital-based one year Prospective Observational Study

Study Period: 1 year from 27th September 2022 to 26th August 2023.

Sample Size: 43

Sample size formula

The minimum sample size formula based on prevalence rate is

$$n = \frac{z_\alpha{}^2 P(1-P)}{d^2}$$

where P is the percentage of success of graft uptake after tympanoplasty and d is the percentage likely difference in the prevalence.

z_α is linked with the level of significance. For 5% level of the significance $z_\alpha = 1.96$.

Reference: Research conducted by Habib ur Rehman and colleagues revealed that the success rate of graft uptake reached 80% in 40 out of 50 cases. Additionally, their study highlighted that the efficacy of tympanoplasty is influenced by a range of factors, with age being particularly significant.[18]

The parameter considered in the calculation of sample size is the success rate of graft uptake, with P = 80% and d = 15% of P (= 12%), thus the sample size is 43.

Sampling technique: Simple Random Sampling

Inclusion Criteria: Patients diagnosed with Chronic Otitis Media, mucosal, inactive type

- In the age group of 18 to 65 years
- With Conductive Hearing Loss of all levels of severity.
- With no evidence of infection in Throat, Nose and Paranasal Sinuses
- Willing to undergo Tympanoplasty for the concerned ear.

Exclusion Criteria:

- Age group < 18 years and >65 years
- Those who refused to consent for participation in the study
- Having component of Sensorineural Hearing loss or Mixed Hearing loss in the diseased ear.
- Chronic Otitis Media, squamosal type
- Patients having active ear discharge
- Patients who have previously received surgical intervention on the ear that is affected.
- Immunocompromised patients
- Active infection in Throat, Nose and Paranasal sinuses

Data collection procedure: Patients visiting ENT & HNS OPD at KLE's Prabhakar Kore Hospital and Medical Research Centre, Belagavi with complaints of Ear Discharge and/or Reduced Hearing with or without other associated complaints were examined thoroughly.

Patient who were willing for pre-operative evaluation were admitted in the ward and all required pre-operative investigations were done.

All patients received Tympanoplasty within a uniform configuration, utilizing a post-aural approach with temporalis fascia as the graft material, and employing an underlay technique for graft placement in all cases.

Following the surgical procedure, all patients were initiated on oral antibiotics and instructed to observe appropriate measures to avoid water ingress into the ear canal, emphasizing the importance of maintaining dry ears.

The removal of skin sutures took place on the seventh day after the operation.

Postoperative assessment of auditory function using Pure Tone Audiometry was conducted three months post-surgery.

Assessment of the success of the graft uptake was performed three months after the surgical procedure.

RESULTS

The study was conducted on 44 participants who voluntarily participated in the study after signing a written informed consent in a language best understood by them.

Total number of patients who underwent Tympanoplasty were 44. Out of these 44 patients, number of male patients were 14 (31.82%) and number of female patients were 40 (68.18%) as shown in Figure 1.

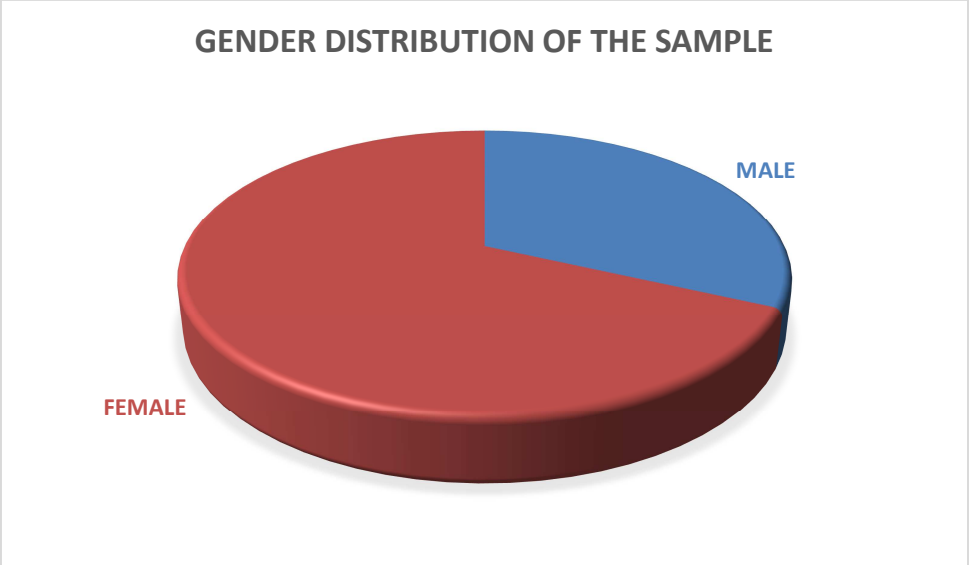

Figure 1: Distribution of participants as per their gender.

For the ease of distribution, patients were divided as per their age into several groups which were randomly made. The initial cohort comprised individuals within the age bracket of 15 to 24 years. The subsequent cohort included individuals within the age group of 25 to 34 years. The third cohort encompassed individuals falling within the age range of 35 to 44 years. The fourth cohort involved individuals within the age category of 45 to 54 years. The fifth cohort comprised individuals in the age range of 55 to 64 years. Each cohort exhibited varying numbers of participants.

There were 13 patients (29.55%) in the first cohort, 12 patients (27.27%) in the second cohort, 9 patients (20.45%) in the third cohort, 6 patients (13.64%) in the fourth cohort, and 4 patients (9.09%) in the fifth cohort.

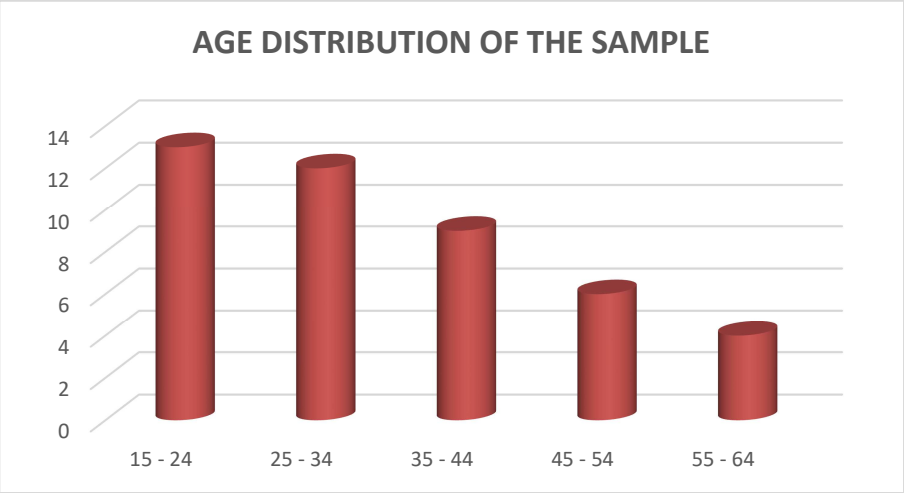

Figure 2: Distribution of patients as per their age.

The youngest patient was 18 years old and the eldest patient was 64 years old. The mean age of the total population was 34.18 ± 12.97 years.

24 (54.55%) patients underwent surgery of the left ear. 20 (45.45%) patients underwent surgery of the right ear. It is noteworthy that none of the patients underwent surgery on both ears simultaneously.

In Table 1, the p value was calculated by using the student's paired t test. It compared the pre- operative hearing of the total population with the post- operative hearing of the total population. Pre- operatively the mean hearing loss was 42.38 ± 9.23 dB {range: 23.33 - 56.66}. The pure tone audiometry was repeated 3 months after the surgery to evaluate the hearing. Post- operatively the mean hearing loss was 21.72 ± 11.05 dB {range:7–54.33}. This showed that there was highly significant improvement for the total population with respect to hearing improvement following the surgery.

Table 1: Comparison of the pre-operative and post-operative hearing results.

PRE-OPERATIVE PTA (dB HL)				POST OPERATIVE PTA (dB HL)					
MEAN	**S.D.**	**MIN**	**MAX**	**MEAN**	**S.D.**	**MIN**	**MAX**	**p VALUE**	**INFERENCE**
42.38	9.23	23.33	56.66	21.72	11.05	7	54.33	< 0.0001	HS

Figure 3, gives a graphical explanation of the data in Table 1.

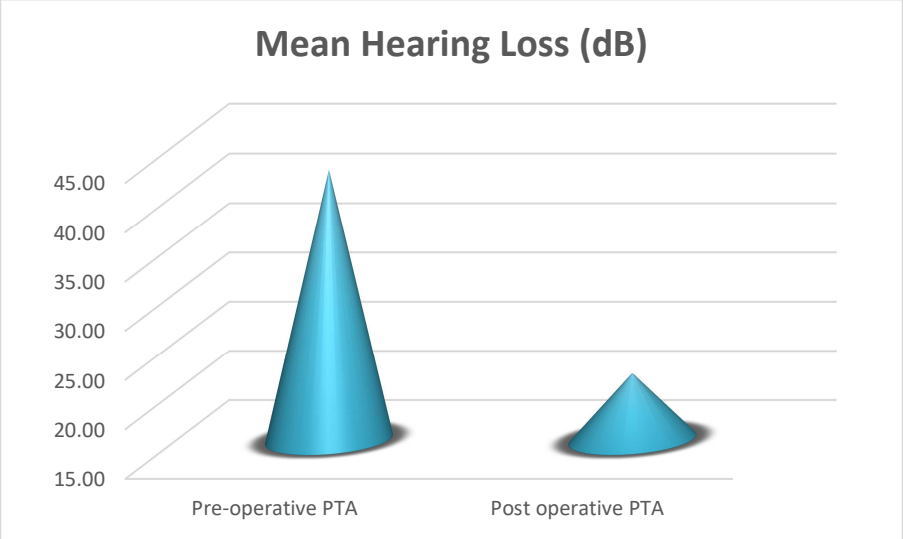

Figure 3: Mean hearing loss (in decibel) before and after the surgery.

The hearing gain was calculated for each individual as the difference between the pre-operative and post-operative hearing loss. The minimum hearing gain was 0.67 dB and the maximum hearing gain was 37.32 dB. The mean hearing gain of the total population 3 months following tympanoplasty was 20.71 ± 10.09 dB as shown in Table 2.

Table 2: The mean hearing gain for the total population 3 months following tympanoplasty.

	MEAN	**S.D.**	**MIN**	**MAX**
HEARING GAIN	20.71	10.09	0.67	37.32

There were 9 (20.45%) cases in which the hearing gain after the surgery was >30 dB. There were 14 (31.81%) cases in which the hearing gain after the surgery was >20 dB but <30 dB. There were 11 (25%) cases in which the hearing gain after the surgery was >10 dB but <20 dB. There were 10 cases (22.73%) cases in which the hearing gain after the surgery was <10 dB.

In Table 3, the p value was calculated by using student's unpaired t test. It compared the hearing gain between male and female population. In males, the mean hearing gain of the total population, 3 months after tympanoplasty was 18.02 ± 9.91 dB {range: 0.67 – 33.67 dB }. In females, the mean hearing gain of the total population, 3 months following tympanoplasty was 21.97 ± 10.1 dB {range: 5 – 37.32 dB }. Though, numerically the hearing gain is more in males as compared to females, it is not statistically significant.

Table 3: Comparison of hearing gain between male and female population.

MALES				**FEMALES**					
MEAN	**S.D.**	**MIN**	**MAX**	**MEAN**	**S.D.**	**MIN**	**MAX**	**p VALUE**	**INFERENCE**
18.02	9.91	0.67	33.67	21.97	10.10	5	37.32	0.2316	NS

The patients were divided into 3 groups based on their age for comparison. Group A included patients from age 18 – 35 years. Group B included patients from age 36 – 50 years. Group C included patients from age 51- 65 years.

There were 28 patients in Group A, 10 patients in Group B and 6 patients in Group C. As seen in Table 4, the mean hearing gain in Group A, 3 months following tympanoplasty was 24.5 ± 8.86 dB {range: 5 – 37.32}. The mean hearing gain in Group B, 3 months following tympanoplasty was 16.67 ± 9.01 dB {range: 5 – 30.33}. The mean hearing gain in Group C, 3 months following tympanoplasty was 9.78 ± 7.03 dB {range: 0.67 - 22}.

Table 4 : Comparison of the hearing gain following tympanoplasty in the three age groups.

	AGE			**p value**	**INFERENCE**
	18-35 (n=28)	**36-50 (n=10)**	**51-65 (n=6)**		
MEAN	24.5	16.67	9.78	<0.0001	HS
S.D.	8.86	9.01	7.03		
MIN	5	5	0.67		
MAX	37.32	30.33	22		

There was high non homogeneity between the hearing gain in the three age groups. When the hearing gain in the patients in Group A was compared to the hearing gain of patients in Group C statistically highly significant difference was noted (p = 0.0006). When the hearing gain in the patients in Group B was compared to the hearing gain of patients in Group C statistically significant difference was noted (p = 0.0222).

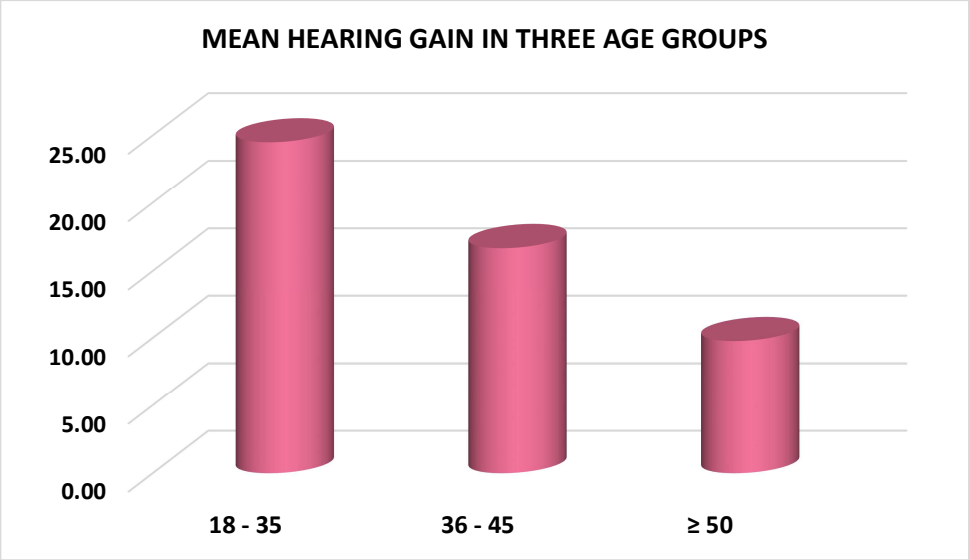

Figure 4: Mean hearing gain (in decibel) in the three age groups, 3 months following tympanoplasty.

Figure 4 is the graphical representation of the Table 4. It shows the mean hearing gain in the three age groups following tympanoplasty.

Out of the total 44 patients who underwent surgery, 36 (81.82%) cases showed successful graft uptake at the end of 3 months. However, 8 (18.18%) cases showed either no graft uptake or a residual perforation 3 months after the surgery.

Table 5: Age wise comparison of graft uptake and graft failure

Age Groups	**Number of graft uptake**	**Percentage of graft uptake**	**Number of graft failure**	**Percentage of graft failure**
18-35 (n=28)	25	89.29%	3	10.71%
36-50 (n=10)	08	80%	2	20%
51-65 (n=6)	03	50%	3	50%
Total population 44	**Total no. of graft uptake** 36	**Overall graft uptake rate** = 81.82%	**Total no. of graft failure** = 8	**Overall graft failure rate** = 18.18%

Table 5 indicates the individuals who experienced graft failure and graft acceptance following tympanoplasty. In the initial cohort, 10.71% of the patients experienced graft failure, whereas 89.29% of the patients exhibited successful graft uptake. Within the subsequent group, 20% of the cases exhibited graft failure, with 80% of cases displaying successful graft uptake. Among the third group, half of the patients encountered graft failure, whereas the remaining half manifested successful graft uptake.

DISCUSSION

Chronic Otitis Media is a commonly encountered middle ear disorder in India. The reason for its high prevalence in a developing nation like India is poor nutrition, poverty, unclean bathing practices, unhygienic lifestyle, lack of awareness and lack of health education among mass population in India.

Discharging ear and hard of hearing are the two most common complaints with which a patient with chronic otitis media will present to the hospital.[19]

Tympanoplasty is a routinely done surgery in otology practice. Tympanoplasty eliminates the pathological tissue in the middle ear and improves the hearing of the affected ear. The objective of the procedure is to replenish sound pressure transformation at the oval window by coupling an intact neo tympanum with a mobile stapes footplate via an unaltered or reconstructed ossicular chain.[20]

The result of tympanoplasty in terms of graft uptake and hearing gain is better when the surgery is done on a dry ear rather than a discharging ear.[21] So, it is important to achieve a dry ear through a preoperative medical line of management. Thus, in the present study, all the surgeries were done on patients with dry central perforation. A dry central perforation is one in which the ear is clean and free from discharge for at least 6 weeks with a non-congested remnant of the tympanic membrane and normal middle ear mucosa.[22]

Many documented factors influence the success rate of tympanoplasty. One such factor that influences the outcome of the surgery is ‘age of the patient’.[23]

In the present study out of 44 patients who underwent tympanoplasty, there was clear female predominance with 68.18% female patients. In a study done by

Mandal et al. in 2022 about tympanoplasty there was female predominance with 52% female patients.[24] In a similar study regarding tympanoplasty done by Latoo et al. in 2020 there was male predominance with male to female ratio of 1.2:1.[19]

In the present study, the patients were divided as per their age into five groups. Every group had an unequal number of patients. The first group had patients with age ranging from 15 – 24 years. The second group had patients with age ranging from 25 – 34 years. The third group had patients with age ranging from 35 – 44 years. The fourth group had patients with age ranging from 45 – 54 years and the fifth group had patients with age ranging from 55 – 64 years. The maximum number of patients (29.55%) were seen in the first group which was the youngest group. On careful observation, we found that the number of patients in a particular group gradually decreases as the age range of the patient serially increases. In a study done by Metgudmath et al. in 2023, the patients were divided age-wise into similar cohorts used in this study. In their study as well, the maximum patients were in the youngest age group, least in the eldest age group and the number of patients decreased as the age range increased serially.[25] This is possible because the younger generation is more observant and attentive about health and healthcare facilities and is more aware of the social implications of hearing loss and thus visits the hospital for check-ups.

In the present study, the youngest participant was 18 years old, while the eldest was 64 years of age. The average age observed among the entire cohort was 34.18 ± 12.97 years. A substantial proportion of the participants in the current study were in their second decade of life. In a research conducted by Bhadesia et al. in 2020 on tympanoplasty, the minimum age recorded was 20 years, whereas the maximum age was 60 years. The average age reported in their study was 32 ± 11.02 years, closely resembling the mean age documented in the present study. They also stated

that chronic otitis media cases were more common in the second decade of life which is similar to the finding of the present study.[26] Harugop et al. in their study on myringoplasty in 2008 and Das et al. in their study on myringoplasty in 2015 also stated that the majority of the patients included in their study were in the second decade of life.[27,28]

In the present study, out of the 44 patients who underwent tympanoplasty 36 (81.82%) cases showed successful graft uptake at the end of 3 months. Similar results were shown by Jaiswani G. et al. in their study regarding tympanoplasty done in 2021, which quoted a graft uptake rate of 80%.[29] In 2013, a study conducted by Rupesh Raj Joshi and team revealed that the graft acceptance rate for the 52 patients who underwent tympanoplasty was 82.69%.[30] According to the study done by Tiwari et al. in 2020, the graft uptake for dry ears was 91.06%.[22] Varitianen et al. in their study on tympanoplasty done on 394 dry ears quoted that the success rate of tympanoplasty was 87.5%.[31] In the present study, there is a noticeable decline in the rate of graft acceptance with increasing age of the patient. Among subjects aged 18-35 years, the rate of graft uptake was recorded at 89.29%. In the demographic aged between 36-50 years, the rate of graft uptake was 80%, which further decreased to 50% for individuals in the age bracket of 51-65 years. P. Hari Krishna et al. (2021) also reported comparable results in their investigation. The graft uptake rate observed in their research was 82.6% among participants aged between 18 and 25 years. However, there was a decrease in the graft uptake rate to 74% when the age bracket extended to 25-45 years.[32] A research conducted by M. Meena revealed that the highest graft uptake rate was observed in individuals aged between 21 to 30 years, reaching a value of 90.90%.[33] In their 2017 research, Amit Sharma and fellow researchers examined tympanoplasty and emphasized that the highest graft uptake rate

was observed in patients within the age range of 21-30 years, reaching 82.35%. Conversely, in individuals aged between 31-40 years, the rate decreased to 75%.[34] Kumar et al. in their study on tympanoplasty asserted that the highest graft uptake rate of 87.5% was seen in patients between the age range of 21 to 30 years.[35] Patil and colleagues, in their analysis of tympanoplasty, indicated that the highest rate of graft uptake, at 89.65%, was noted in individuals aged between 21 and 30 years.[36] The conclusions of the present study are in agreement with that of multiple other studies. It has been noted that younger individuals demonstrate a higher level of graft uptake in comparison to the elderly population. The reason behind this phenomenon may be linked to the superior healing capabilities that younger patients possess in comparison to their older counterparts.

In the present study out of 44 tympanoplasty surgeries that were performed graft failure was seen in 8 (18.18%) cases. On the age-wise distribution of these failures one can understand that the youngest age group showed the least 3 (10.71%) failures followed by the middle age adults which showed 2 (20%) failures and the highest rate of graft failure in the present study was in the senior adult's age group in which 3 (50%) cases showed graft failure. Various other studies had similar results. A study carried out by S. Demirci and colleagues in 2015 revealed that the rate of graft failure was higher among elderly patients, averaging 63 years old, and lower among younger patients, averaging 34 years old.[37] In a study conducted by Bhoomi and her team, the occurrence of graft rejection was identified to be 14.28% among patients aged between 31 and 40 years. Conversely, individuals aged 21-30 exhibited a reduced graft rejection rate of about 10.52%.[38] Sarker MZ, in their research on myringoplasty, highlighted that the graft failure rate was 3.4% in individuals aged 28-39 years, but climbed to 6.3% in those aged 40-49 years. Although not reaching

statistical significance, there was a noticeable rise in graft failure rate with the patients' advancing age.[39]

All the audiometry in the present study was performed by the same audiologist in a sound-isolated and soundproof room using a MAICO^{TM} MA53 audiometer. Air conduction and bone conduction threshold curves were plotted as per standardized audiology protocols. Pure tone audiometry was performed in all patients, once before the surgery during pre-operative evaluation and the second one was 3 months after the surgery.

In the present study, the mean pre-operative hearing loss was 42.38 ± 9.23 dB. The mean post-operative hearing loss was 21.72 ± 11.05 dB. This showed that in the present study there was highly significant improvement for the total population in terms of hearing 3 months after the surgery. ($p<0.0001$). A study done by Tae-ho Eom et al. in 2020 regarding tympanoplasty in elderly patients stated that for the population with a mean age of 45 years (range = 15 – 64 years) the mean pre-operative hearing loss was 35.7 dB and the mean post-operative hearing loss following the surgery was 25.2 dB thus showing definite improvement in the hearing following the surgery.[40] In a study done by Harkare VV et al. in 2023 on 70 patients undergoing tympanoplasty with mean age of presentation as 28.78 years, the mean pre-operative hearing loss was 44.54 ± 7.66 dB and after the surgery, it was improved to 33.51 ± 4.54 dB.[4] S. Demirci et al. in their study in 2015 asserted that the mean pre-operative hearing loss was 37.3 ± 10.3 dB which improved to 23 ± 10.4 dB after the surgery.[37] In the present study the mean hearing gain was 20.71 ± 10.09 dB. {range 0.67 – 37.32}. A study on tympanoplasty and post-operative hearing gain done by Toss et al in 1972 stated that the mean hearing gain after the surgery was 23.2 dB[16] which is visibly consistent with

the findings of the present study. Poonam KC's research on tympanoplasty highlighted that the post-operative mean hearing gain was 18.36 ± 4.56 dB.[41]

In the present study, we divided the patients post-operatively into three groups as mentioned before as per their age. The first group had patients from age 18 to 35 years, the second group had patients from 36 to 50 years and the third group had patients from 51 to 65 years. The mean hearing gain in the first group from 18 to 35 years was 24.5 ± 8.86 dB {range 5 to 37.32 dB}. The mean hearing gain in the second group from 36 to 50 years was 16.67 ± 9.01 dB {range 5 to 30.33 dB}. The mean hearing gain in the third group from 51 to 65 years was 9.78 ± 7.03 dB {range 0.67 to 22 dB}. There was clear statistical significance in the mean hearing age of the three groups in the present study suggesting that as the age of the patient increased, the mean hearing gain after the surgery decreased. Proctor et al. in their study on tympanoplasty in 1972 stated that the mean hearing gain in the age group up to 40 years was 11 dB, in the age group from 40 to 60 years was 8 dB, and for patients above 60 years was 4 dB.[42] The findings of their study were consistent with the findings of the present study which suggested that mean hearing gain after surgery decreased as the age of the patient increased.

Studies have proved that the results of the surgery deteriorate with respect to hearing improvement, with the advancing age of the patient. The possible reason for this could be the physiological stiffening of the middle ear transmission system in elderly patients.[43] One more possible reason could be the ineffective middle ear damping system in elderly patients as compared to younger patients.[44] Miri H and colleagues in 1981 proposed that a minor surgical procedure might worsen the fragility of the cochlea in older individuals, leading to unfavourable surgical outcomes in the elderly population.[45] Research done in 2000 by Sakagami M and team asserted

that the chronic inflammation that commences the decline in auditory function and the influence of aging on the cochlea are deemed to be the primary factors responsible for the decrease in postoperative hearing in older individuals.[46]

Thus, during the pre-operative counselling of older patients who require tympanoplasty, the surgeon must correctly guide the patient and the attenders regarding the expected outcomes of the procedure and provide them with a realistic idea about the benefits and pitfalls of the procedure at that age.

CONCLUSION

- Chronic Otitis Media is a commonly seen middle ear disorder in India and Tympanoplasty is the final surgical conquest to deal with the conductive hearing loss associated with it.
- Chronic Otitis Media is most commonly seen in the second decade of life.
- In our study 44 tympanoplasty surgeries were performed. Every patient underwent pre-operative hearing assessment and post-operative hearing assessment after 3 months of the surgery.
- All the patients included in the present study showed post-operative hearing improvement following tympanoplasty.
- The hearing gain was maximum (mean = 24.5 dB) when the age of the patient was between 18-35 years and gradually decreased (mean = 16.67 dB) as the age of the patient increased to 36-50 years and was the least (mean = 9.78 dB) when the patient crossed 50 years of age.
- The rate of graft acceptance observed in our investigation after tympanoplasty reached 81.82%.
- The overall percentage of graft failure in the present study was 18.18%. The graft failure rate was 10.71% when the age of the patient was between 18-35 years. It increased to 20% when age of the patient increased to 36-50 years. The graft failure rate for patients over 50 years of age was 50% in the present study.
- Thus we conclude that, ‘age of the patient’ impacts the success rate of the tympanoplasty.

LIMITATIONS OF THE STUDY

- The surgeries were performed by different surgeons with different levels of expertise and different levels of skill sets because achieving the intended sample size within the designated one-year timeframe proved unattainable when assigning all surgeries to a sole surgeon.
- In the present study, the follow period had to be restricted to 3 months, as the overall study duration was constrained to 1 year because of academic obligations.

SUMMARY

- The study was a prospective observational study done in the department of Otorhinolaryngology and Head and Neck Surgery, Jawaharlal Nehru Medical College and KLE's Dr. Prabhakar Kore Hospital and Medical Research Centre, Belagavi, Karnataka for a period of one year.
- The goal of the study was to find out whether 'age of the patient' influences the outcomes of tympanoplasty.
- In the present investigation, a total of 44 individuals diagnosed with Chronic Otitis Media, specifically the mucosal, inactive subtype presenting with conductive hearing loss in the absence of complications, were subjected to tympanoplasty. The subjects in the research were spread out across diverse age groups.
- Post- operative hearing assessment was done for all these cases 3 months after the surgery.
- The graft uptake was checked 3 months after the surgery.
- It was seen that the graft failure rate was more in older patients than the younger patients.
- All cases showed a noticeable increase in hearing improvement following tympanoplasty. However, with advancing age of the patient the post operative hearing improvement decreased.

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ANNEXURE – I - INFORMED CONSENT FORM

IMPACT OF AGE OF THE PATIENT ON THE OUTCOME OF TYMPANOPLASTY IN ADULT POPULATION- A PROSPECTIVE OBSERVATIONAL STUDY AT KLE'S DR. PRABHAKAR KORE HOSPITAL AND MEDICAL RESEARCH CENTRE.

Name of Student/Principal Investigator:

Name of Guide/Co Investigators:

Objective: The objective of this study is to determine if age of the patient is a factor influencing success rate of Tympanoplasty based on following parameters:-

Graft uptake

Post operative Hearing gain

Introduction: National average of CSOM is 5.2% and hence India has been classified as the high prevalence country. Tympanoplasty is an effective procedure that can lead to improvement in hearing function in patients and prevention of recurrent ear discharge. Optimal results can be achieved through use of the appropriate surgical technique. This study will help us to know if age of the patient has any impact on the outcome of tympanoplasty in adult population in the age group of 18-65 years.

Explanation of procedure: In this study, an audiometric evaluation shall be conducted for the cases selected for tympanoplasty (ear surgery). Two such tests would be performed, one before the surgery and the other 3 months after the surgery in ENT OPD.

Withdrawal from participation in the study: Participation in this study is voluntary. You will be free to decide whether to participate in this study or continue

participation once enrolled. In case you decide to withdraw your participation, you are free to do so. However, please convey the decision to the principal investigator.

Possible benefits from participating in the study: You will/will not have nor get any benefits by participating in this study. The data gathered will help the population at large.

Possible risks from participating in the study: There are no risks involved in participating in this study.

Privacy and confidentiality: The information collected from you will be coded, to prevent any person from identifying you. Your identity will never be revealed. The data collected from you will be kept confidential and only processed or aggregated data will be used for publication.

Financial incentives: You will not receive any payment for participating in this study.

Authorization for publication of aggregated data: Results obtained after processing of the aggregated data will be published for scientific purposes and or presented to scientific groups. However, your identity will never be revealed.

Questions: In case of any questions with regard to this study, you are free to contact:

"Name of student–_____, mobile number-_____, email ID- _____"

If you have any question or complaints with regard to your right as study participant you may contact _____, Chairperson, Ethical committee of JNMC, 0831-2473777 Extension _____.

Legal rights: By signing this consent form, we are not waving any of your legal rights.

ANNEXURE – II - PROFORMA FOR DATA COLLECTION

CHIEF COMPLAINTS:-

HISTORY OF PRESENTING COMPLAINTS:-

PAST HISTORY:-

PERSONAL HISTORY:-

FAMILY HISTORY:-

GENERAL PHYSICAL EXAMINATION:-

EAR EXAMINATION	RIGHT	LEFT
EXTERNAL APPEARANCE		
Preauricular Region		
Pinna		
Postauricular Region		
Tragal Tenderness		
Mastoid Tenderness		
EAC		
Tympanic Membrane		

TUNING FORK TEST

	RIGHT	LEFT
RINNE'S 256 Hz		
512 Hz		
1024 Hz		

WEBER'S

ABC

PTA FINDINGS PREOPERATIVELY:- RIGHT LEFT

NOSE EXAMINATION

External Appearance

Anterior Rhinoscopy

Posterior Rhinoscopy

ORAL CAVITY AND OROPHARYNX EXAMINATION

Oral Cavity

Oropharynx

THROAT EXAMINATION

Indirect Laryngoscopy

NAME OF THE SURGERY PERFORMED

DATE OF THE SURGERY

PTA FINDINGS POST-OPERATIVELY:-

RIGHT

LEFT

ANNEXURE – III - PHOTOGRAPHS

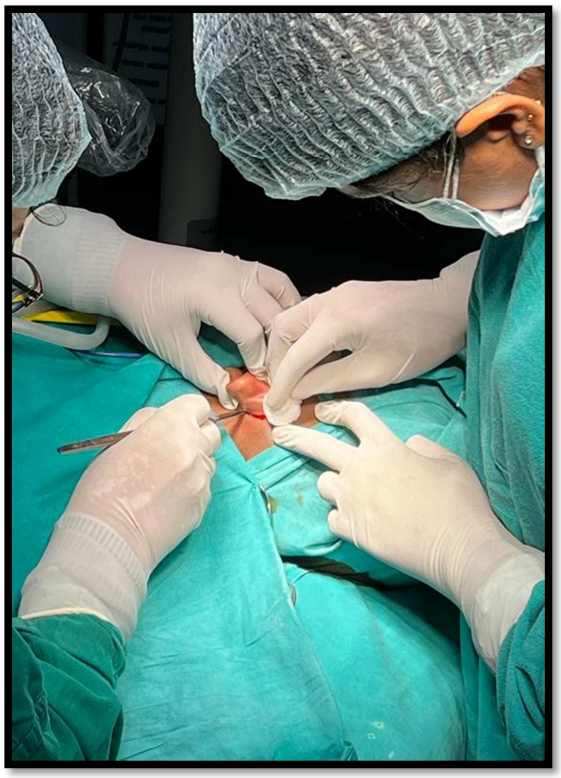

IMAGE 1: SURGEON GIVING POSTAURICULAR INCISION FOR TYMPANOPLASTY

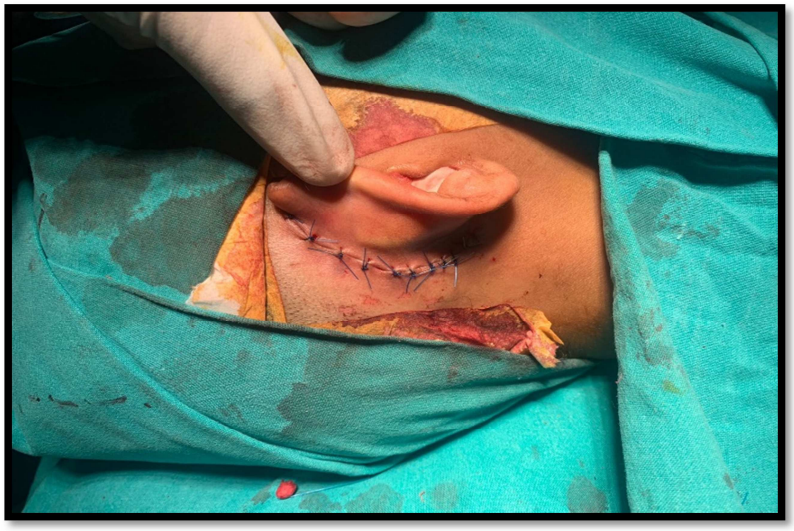

IMAGE 2: INTRA-OPERATIVE IMAGE AFTER POSTAURICULAR SUTURING

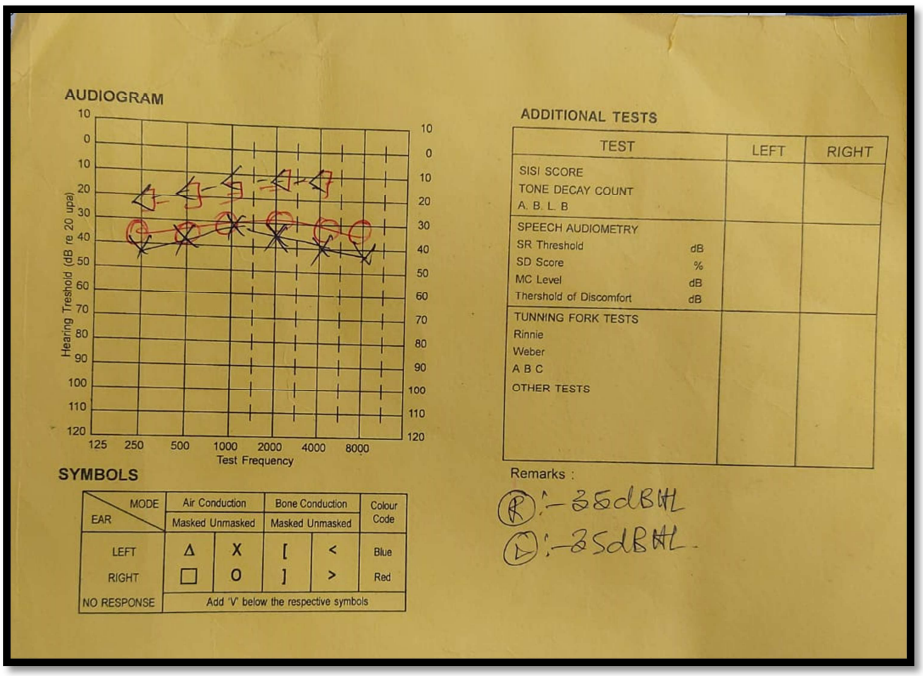

IMAGE 3A: PURE TONE AUDIOGRAM SHOWING CONDUCTIVE HEARING LOSS

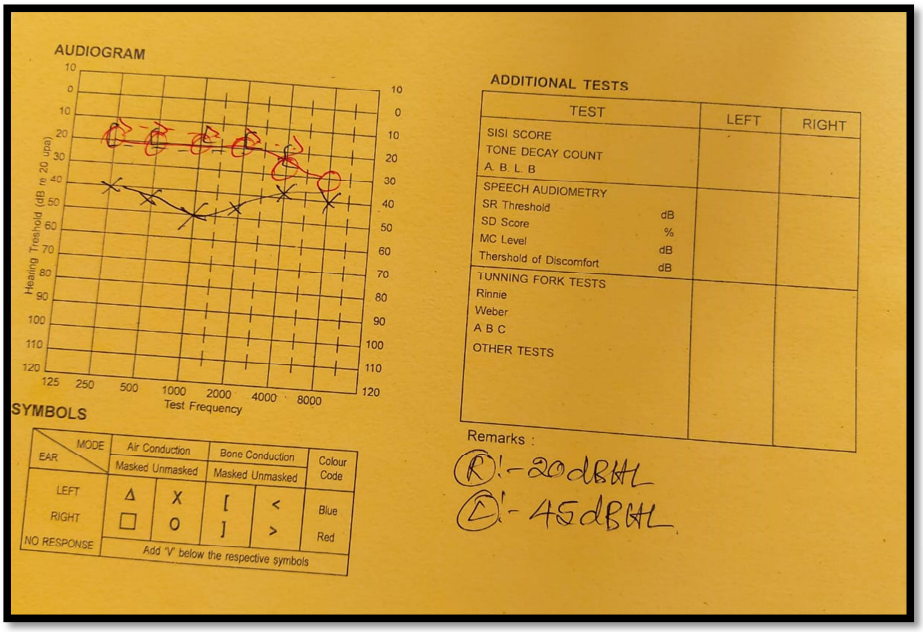

IMAGE 3B : PURE TONE AUDIOGRAM SHOWING CONDUCTIVE HEARING LOSS

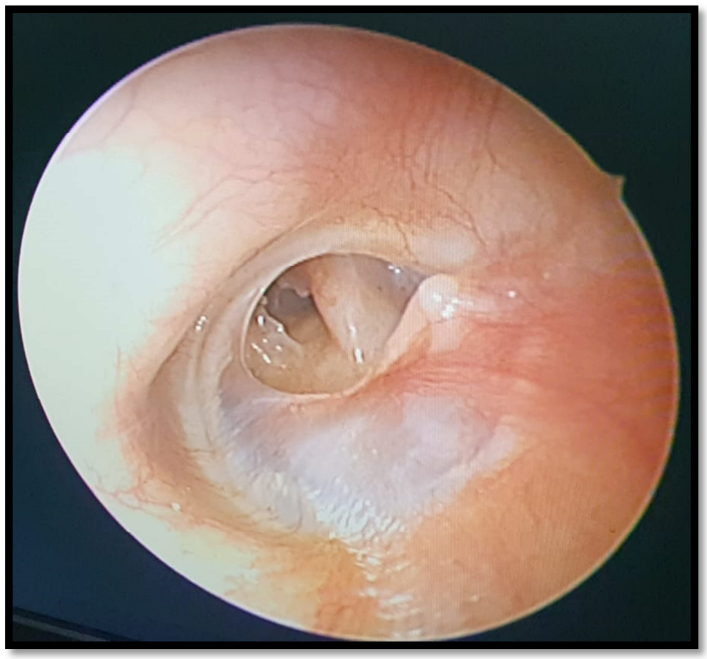

IMAGE 4 : DRY CENTRAL PERFORATION IN THE LEFT EAR

IMAGE 5 : MASTOID DRESSING AFTER A CASE OF TYMPANOPLASTY

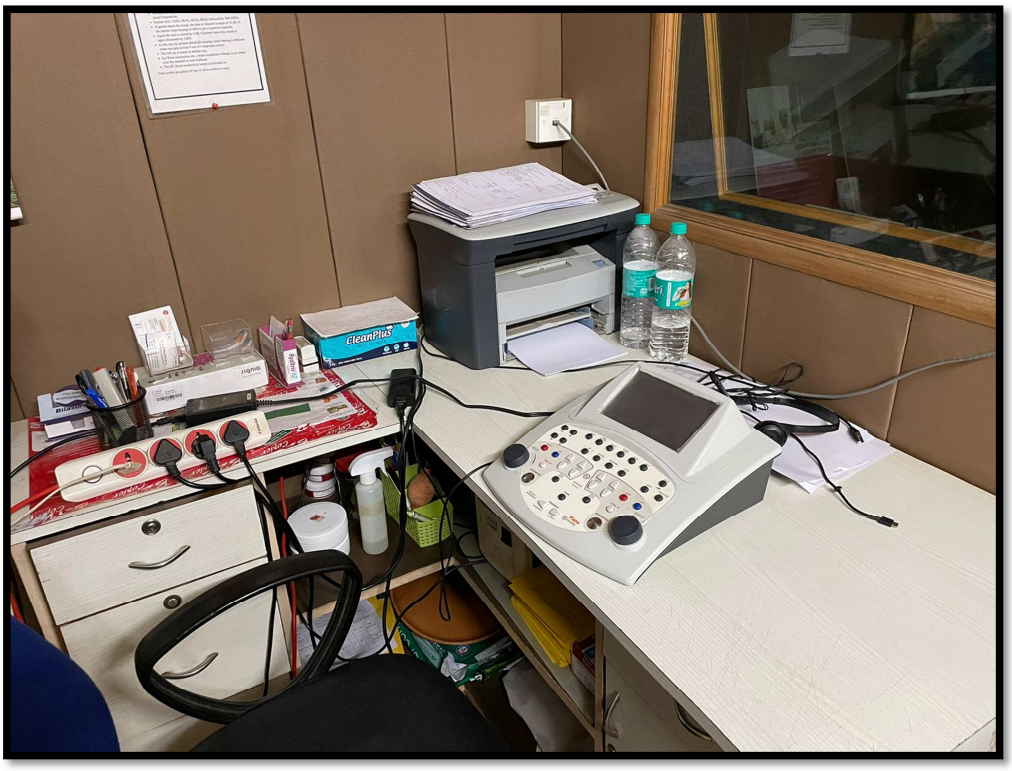

IMAGE 6: AUDIOLOGY WORKSTATION IN ENT OPD

ANNEXURE - IV - KEY TO MASTERCHART

GLOSSARY	MASTERCHART
SCP	Small Central Perforation
MCP	Medium Central Perforation
LCP	Large Central Perforation
dB	Decibel
HL	Hearing Loss
M	Male
F	Female
PTA	Pure Tone Audiometry
IP Number	In-Patient number

ANNEXURE – V - MASTER- CHART

Sr. No.	IP number	Age (years)	Gender	Affected Ear	Symptoms duration (years)	Size of perforation	Pre-operative PTA (Db HL)	Duration of Surgery (minutes)	Graft uptake post surgery	Post operative PTA (3 MONTHS)	Hearing Gain
1	1155683	18	F	Left	8	MCP	31.66	108	YES	10	21.66
2	1155687	18	F	Left	1	MCP	40	135	YES	12	28
3	1139036	30	F	Left	0.5	MCP	40	120	YES	12	28
4	1139653	43	M	Left	3	LCP	40	150	YES	18	22
5	1199989	27	F	Left	7	LCP	55	154	YES	20	35
6	1201017	52	F	Right	5	LCP	50	150	YES	28	22
7	1139657	30	F	Left	2.5	MCP	35	124	YES	15	20
8	1153020	29	F	Left	2	LCP	55	155	YES	18.33	36.67
9	1158554	35	F	Right	0.5	LCP	35	130	YES	8	27
10	1185912	25	F	Right	1	LCP	40	140	YES	8.33	31.67
11	1195449	22	F	Left	8	LCP	45	135	YES	16	29
12	1194714	36	M	Left	8	LCP	55	150	YES	24.66	30.33
13	1186547	29	M	Right	4	LCP	55	140	YES	21.33	33.67
14	1186539	40	F	Left	7	LCP	50	160	YES	20	30
15	1184433	18	M	Left	1	SCP	30	100	YES	10	20
16	1200276	37	M	Left	2	SCP	30	135	YES	17	13
17	1196989	57	F	Right	2	SCP	36	162	NO	28	8
18	1159950	23	F	Right	5	MCP	48.33	135	YES	18.66	29.67
19	1184450	24	F	Right	4	LCP	56.66	138	YES	19.33	37.32
20	1193425	30	F	Left	2	LCP	50	128	YES	18.33	31.67
21	1190740	28	F	Left	1	SCP	23.33	110	YES	8.33	15
22	1189873	47	F	Right	1	LCP	56.66	150	NO	48.33	8.33
23	1189102	30	F	Left	4	MCP	50	150	YES	24.66	25.34
24	1163839	22	M	Right	0.5	SCP	26.66	125	YES	7.33	19.33
25	1190779	24	M	Right	0.25	MCP	41.66	150	YES	19	22.66
26	1208371	49	F	Left	0.5	SCP	38.33	145	NO	35.33	5
27	1193021	20	F	Right	10	LCP	50	150	YES	20	30
28	1198670	63	M	Left	1	MCP	36.66	140	YES	24.66	12
29	1203597	18	F	Left	0.25	SCP	25	120	YES	7	18
30	1198524	34	M	Left	0.25	LCP	48	135	YES	16	32
31	1142083	35	F	Right	0.75	MCP	40	135	YES	12	28
32	1208347	24	M	Left	0.5	SCP	31.66	130	YES	12	19.66
33	1206147	60	F	Left	5	MCP	48.33	150	NO	40.33	8
34	1205825	39	M	Left	0.75	MCP	35	125	YES	22	13
35	1205786	47	F	Right	3	LCP	50	130	YES	27.33	22.67
36	1179200	18	F	Left	2	MCP	46.66	130	NO	38.33	8.33
37	1141286	35	F	Right	1	LCP	36.66	160	YES	18.66	18
38	1170927	64	M	Right	15	LCP	55	180	NO	54.33	0.67
39	1179984	33	F	Right	7	LCP	48.33	150	YES	18	30.33
40	1200276	41	M	Right	5	MCP	45.33	140	YES	36.33	9
41	1192271	32	F	Left	3	LCP	45	150	NO	40	5
42	1183543	19	M	Right	4	LCP	30	140	NO	25	5
43	1176691	46	F	Right	5	LCP	38.33	150	YES	25	13.33
44	1196156	53	F	Right	2	LCP	40.66	140	YES	32.66	8