"ASSESSMENT OF HEARING STATUS IN PATIENTS WITH TYMPANIC MEMBRANE PERFORATION AND IT'S PARAMETERS IN CHRONIC OTITIS MEDIA: AN OBSERVATIONAL STUDY"

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Sub: Institutional Ethical Clearance for the study.

With reference to the above, we wish to inform you that your proposed research project titled **"ASSESSMENT OF HEARING STATUS IN PATIENTS WITH TYMPANIC MEMBRANE PERFORATION AND IT'S PARAMETERS IN CHRONIC OTITIS MEDIA – A ONE YEAR PROSPECTIVE OBSERVATIONAL STUDY IN KLES DR PRABHAKAR KORE HOSPITAL AND MEDIC AL RESEARCH CENTRE",** is ethical and justifiable. The proposed research project has been cleared by the JNMC Institutional Ethics Committee on Human Subjects Research.

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ABSTRACT

Background:

Chronic Otitis media is a worldwide health problem leading to the hearing loss in young and middle-aged patients. Tympanic membrane perforation in the middle ear helps us to anticipate the magnitude and incidence of hearing loss. The type and the degree of the hearing loss is dependent on the site and size of the perforation.

Objectives:

1. To study the site, size and duration of tympanic membrane perforation and to assess their correlation with type, frequency and degree of hearing loss in patients of Chronic Otitis Media (COM).
2. To record the status of tympanic membrane in these patients with COM.

Material and Methods:

This observational study was conducted in the Department of Otorhinolaryngology and Head and Neck Surgery of KAHER's Jawaharlal Nehru Medical College and KLES Dr. Prabhakar Kore Hospital and Medical Research Centre, Belagavi from January 2021 to December 2021. 113 ears with tympanic membrane perforations were observed in this study to assess the size by using Image J software, site of the perforation by doing Otoendoscopy and its associated hearing loss by Pure tone audiometry.

Results:

The hearing loss was more in large central perforations with more severity of hearing loss seen in posterior quadrant perforation. The greater hearing loss was seen in posterosuperior quadrant located perforations. The hearing loss does not increase with the duration of ear discharge. Overall, conductive hearing loss was most commonly seen in COM patients.

Conclusion:

The hearing loss in frequency dependent, with maximum hearing loss at lower frequencies. The magnitude of hearing loss increases with increase in size of tympanic membrane perforation. Perforation involving posterior quadrants result in more hearing loss than perforations involving quadrants. The hearing loss does not dependent on the duration of ear discharge.

Keywords: Hearing loss, Image J software, perforation, COM

LIST OF ABBREVIATIONS

GLOSSARY	ABBREVIATIONS
COM	Chronic Otitis media
AOM	Acute Otitis media
TM	Tympanic membrane
ASQ	Anterosuperior quadrant
AIQ	Anteroinferior quadrant
PSQ	Posterosuperior quadrant
PIQ	Posteroinferior quadrant
EAC	External Auditory canal
OME	Otitis media with effusion
ET	Eustachian tube
BM	Basilar membrane
CSF	Cerebrospinal fluid
PCHI	Permanent childhood hearing impairment
PTA	Pure tone Audiometry
A-B GAP	Air Bone gap
AC	Air Conduction
BC	Bone Conduction
HL	Hearing loss
CHL	Conductive hearing loss
MHL	Mixed hearing loss
SNHL	Sensorineural hearing loss
ANSD	Auditory neuropathy spectrum disorder
CCDs	Charge coupled cameras
WHO	World Health Organization
Hz	Hertz
kHz	Kilohertz
dB	deciBel
MEC	Middle ear cleft
ME	Middle ear
EE	External ear

IE	Inner ear
TC	Tympanic cavity
PT	Pars tensa
PF	Pars flaccida
TA	Tympanic annulus
HOM	Handle of malleus
FOS	Footplate of stapes
LP	Lamina propria
RW	Round window
OW	Oval window
SP	Sound pressure
GT	Granulation tissue
NOM	Necrotising otitis media
MiHL	Mild hearing loss
MoHL	Moderate hearing loss
SHL	Severe hearing loss
PHL	Profound hearing loss
SCP	Small central perforation
MCP	Medium central perforation
LCP	Large central perforation

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INTRODUCTION

COM is a chronic infection of the MEC and perforated TM and discharge of a minimum of 6 weeks. COM is a major health issue that affects people all over the world and that requires medical attention, especially in children from low socio-economic status who have previously received inadequate treatment and negligent medical attention. It is very common condition and significant contributor to the avoidable HL. India has highest (>4%) prevalence group for the burden of COM, according to a WHO classification.[1]

To understand HL better, it is necessary to be familiar with the theory of ME sound transmission that is infected, which COM frequently presents with. It is a field of extensive study for otologists.[1]

The size and location of the TM defect, the dysfunction of the ossicular chain, and the ME status are the elements that determine the type and degree of HL.[2]

Several clinical investigations have been carried out recently in COM patients to know the correlation with HL with characteristics of perforation, such as size and location, but the results were found to be ambiguous and contradictory.[1]

It is generally accepted that the severity of HL and the site of the perforation are connected. Nevertheless, there are several contradictory studies addressing the HL related to size, location, and duration of TM perforation.[3]

There are additional clinical alterations in the middle ear so it is difficult to correlate the consequences of TM perforations on sound transmission and its dynamics.

We could predict the severity and frequency of hearing loss if we had a better grasp of the impact of perforation on the middle ear. The development of hearing loss and disease length and kind are positively correlated, which suggests that the sooner the condition is controlled and treated, the better the results will be. More of these investigations will enable clinicians to forecast whether hearing loss is caused by middle ear alterations rather than just perforation alone.[3]

This study is done to correlate the size, location and duration of the TM perforation and to assess impact on the types, degree and frequency of HL in patients with COM.

OBJECTIVES

1. To study the site, size and duration of ear discharge in TM perforation and to assess the impact with types, frequency and degree of HL in patients of COM.
2. To record status of tympanic membrane in these patients with COM.

REVIEW OF LITERATURE

The ear is divided into three parts. They are EE, ME and IE. Figure 1 illustrates parts of ear. The TM is present in the ME cavity.

The TM also known as the eardrum, is a thin, semi-transparent, oval shape which separates EAC from TC. It is located at the lateral end of the external acoustic meatus and is medially inclined from the back to the front and from the top to the bottom. As a result, the tympanic membrane's lateral surface faces anteriorly and inferiorly

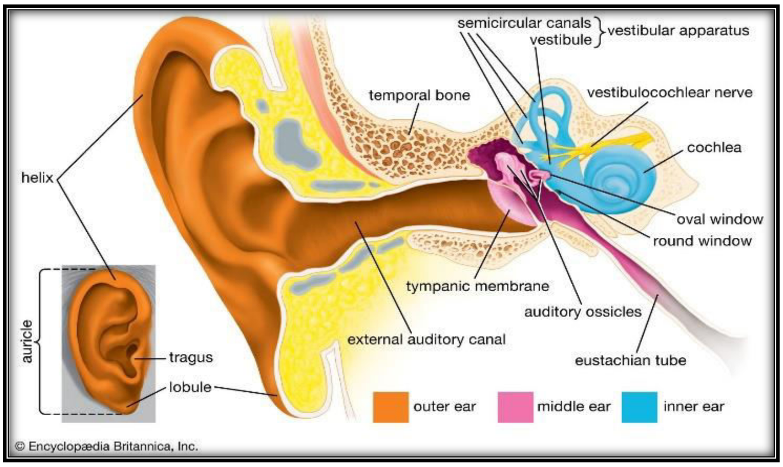


Fig 1: Diagramatic representation of anatomy of the ear.[47]

The TM (Figure 2) consists of three layers, including a film of connective tissue that is epithelium-lined on both sides. A thin epidermis, or stratified squamous keratinized epithelium, that is continuous with the epidermis of the external acoustic meatus, covers its lateral (outer) surface. The medial (inner) surface is covered by a simple cuboidal epithelium that is continuous with the epithelium of the mucous membrane of the tympanic cavity. The blood vessels and mucous membrane of the tympanic cavity are located in the middle fibrous layer, known as the lamina propria. This layer is formed of fibroelastic connective tissue.

The lamina propria, a middle fibrous layer made up of loose, fibroelastic connective tissue, is where the TM's vessels and nerves are found.

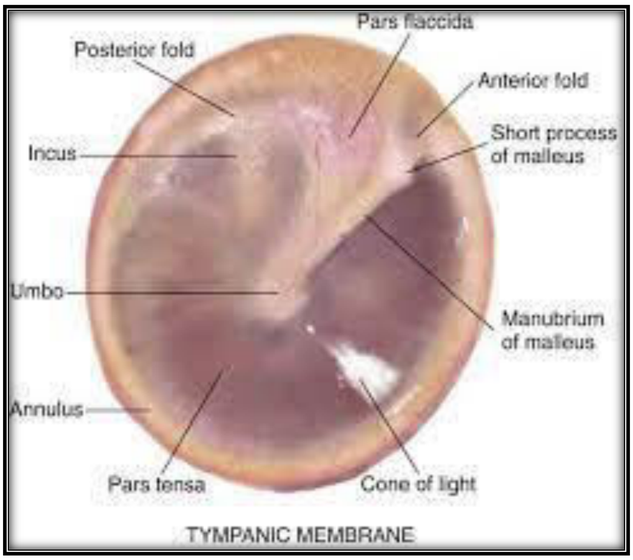


Fig 2: Surface anatomy of tympanic membrane.[41]

The TM makes a 55° angle with the EAC floor because it is broader in the superior than inferior directions. The largest width is about 9–10 mm from PS to AI, and its shortest diameter is about 8–9 mm perpendicular to this. Tympanic annulus is a fibrocartilaginous ring that is formed by thickening the majority of the TM's circumference and resting in the tympanic sulcus. Anterior and posterior malleolar folds extend medially from the superior limits of the sulcus to the lateral process of the malleus, where the annulus of TM develops into a fibrous band. The PF is a small, triangular region of the TB located above the malleolar folds and within the Rivinus notch. Its base lacks a tympanic annulus.

The PT, which is concave in the direction of the ear canal but also convex between the lateral attachment of the TA and the centre of the TM, where the tip of the HOM is linked to the umbo, makes up the remaining section of the TM.

The external auditory meatus and the middle ear are both supplied by branches from which the tympanic membrane receives its arterial blood supply. The connective tissue layer of the lamina propria contains numerous anastomoses that connect these two sources. The mucosal vessels come from the anterior tympanic branches of the maxillary artery, the stylomastoid branch of the posterior auricular artery, and the deep auricular branch of the maxillary artery, which emerges through the external auditory meatus.

SITE OF PATHOLOGY:

Anatomically, the PT is separated into four quadrants, however when it comes to pathologies such TM perforation, it is classified into anterior, posterior, or inferior (Figure 3). Therefore, it is better to divide into thirds rather than quarters. The percentage of the pars tensa affected by a COM should be recorded using percentages rather than vague terms like "little," "big," and "subtotal." By definition, all pars tensa perforations are "central," signifying "tubotympanic." The attic pars flaccida needs to be cleaned of any material and examined for pathology, which could exist either independently or in conjunction with pars tensa illness. All attic sickness is, by definition, "atticoantral" and "marginal.". The term "marginal" is used in conjunction with the absence of annulus, which is unusual for the PF.

When used to describe PT pathology, the term "marginal" might be difficult to understand and should be avoided. TA is always present in PT perforations, unless it has already been surgically removed.

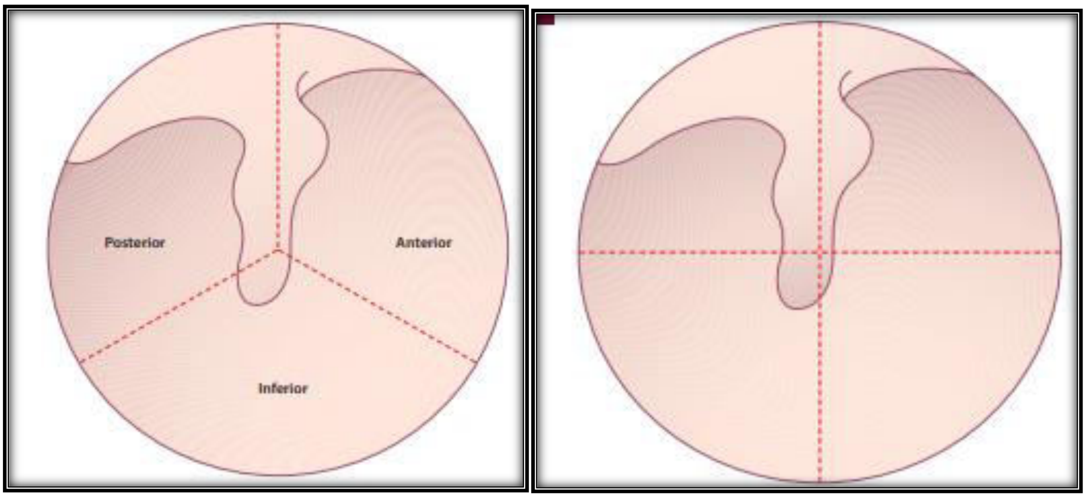


Fig 3: Quadrants of the TM. [41]

EAR OSSICLES:

Ossicular chain, which transfers sound from TM to cochlea, is made up of the malleus, incus, and stapes. The malleus, the most lateral of the ossicles, has an anterior and lateral process, a neck, a manubrium (handle), and a head (caput). The biggest ossicle, the incus, is situated medially to the malleus and is the largest of all ossicles. The stapes is the smallest and medial ossicle. The stapes head articulates with the lenticular process of the incus, whereas the stapes footplate is situated in the OW and is encircled by the stapediovestibular ligament.

The three ossicles are connected with each other by synovial joints which allow for the transmission of the acoustic stimulus from the TM. When velocity is reduced by a factor of 2.1, the lever action multiplies by 2.1, giving rise to a net mechanical advantage or impedance ratio of 4.4. The geometric malleus length is around 2.1 times of the incus, therefore lever action is multiplied by 2.1. Additionally, lever action alters with frequency, peaking at 2kHz.

The anterior-posterior axis of the malleus-incus complex, which runs through the ossicles' gravitational centre, is where the malleus and the incus spin. The malleus and the incus move relatively little at low frequencies, but their motion becomes more complex at higher frequencies, allowing some slippage between them to carry higher-frequency sounds more effectively.

Similar movement patterns may be seen in the stapes, including straightforward spatial movements along the long and short axes of the footplate at low frequencies and movements that resemble simple piston motions at higher frequencies. Ossicular discontinuity, whether congenital or acquired, affects the cochlear partition pressure between the round and oval windows, which drives the cochlear travelling wave, and results in the loss of the ossicular coupling-led preferential distribution of sound to the oval window. A pathological bridging between the ossicles or an incomplete discontinuity will result in substantially less CHL overall than the expected 60dB. (e.g., a cholesteatoma).

When ossicular joints or their ligaments, particularly the anterior malleolar ligament, are fixed, such as in chronic adhesive otitis media, continuity is present but mobility is constrained, creating a high impedance in the system. The middle ear's built-in redundancy mechanisms help to offset this to some extent. As a result, the HL that results are less severe than that from ossicular disruption. The output substrate of EAC and ME centred on stapes footplate affects forward propagation to the cochlea in otosclerosis, one type of ossicular fixation, leading to a considerable CHL.

The fractured ossicular bridge is attempted to be repaired with tympanoplasty and ossicular chain reconstruction surgery utilising either soft tissue or synthetic or autologous grafts.

The two main methods to compensate for the loss of acoustic energy caused by the transition from an air-to-a-fluid medium at stapes-OW contact which is a pressure gain in middle ear transmitted sound is caused by surface area ratio of TM to FOS and lever actions of TM and the ossicular levers.

Ossicular coupling, which is mainly contributory to the pressure gain, is frequency-dependent; between 0.25 and 0.5kHz it is 20dB, reaching to 26.6dB at 1kHz and then decreasing by about 8.6dB per octave until near zero above 7kHz. At higher frequencies compared to lower frequencies, the cochlear impedance is reduced. Depending on the sound frequency, impedance matching has different degrees of effectiveness. The average SP loss at the cochlea is 39.5dB at 2kHz, where the external canal and middle ear transfer acoustic energy most effectively. This loss is partially offset by the external canal's gain of 9dB and the middle ear's gain of 26.6dB, giving the ear a total gain of 35.6dB after accounting for some loss caused by frequency-dependent middle ear function.

In humans, at 2.7kHz (i.e. the resonance of the canal) the SP loss is approximately 35dB, which is very closely matched by the external and the middle ear transfer function.

EUSTACHIAN TUBE:

The anteromedial two-thirds of the eustachian tube (ET) are fibrocartilaginous, whereas the remaining part is bony. It is located in anterior wall of TC. ET is closed when at rest and opened when tensor veli palatini muscle receives innervation from the trigeminal nerve.

The lateral fat pad of Ostmann, a body of fat that borders the lateral face of the fibrocartilaginous tube and supports the tube's resting closure. The tubal opening is best demonstrated at 6–8kHz, i.e. high frequency sounds.

Eustachian tube dysfunction is defined when the middle ear cavity is devoid of air, such as in the early stages of otitis media with effusion (OME), which results in low-frequency HL. As the condition worsens, fluid in the middle ear cavity increases leading to high-frequency HL. One of the most frequent causes of HL in children, glue ear, may be predicted using this model. It's vital to remember that OME physically impedes transmission, in contrast to perforations, which do not hinder eventual sound transmission.

At least three physiological processes are carried out by the eustachian tube, including defence against pressure changes and secretions in the nasopharynx, the drainage of ME secretions into the nasopharynx, and the ventilation of ME to restore absorbed oxygen and bring pressure to equilibrium with ambient atmospheric pressure.

At rest, the eustachian tube is normally closed. Continuous active dilation (opening) of the tube keeps the middle ear pressures close to ambient.

As a result, the exchange of gas that occurs when ET opens between the ME and nasopharynx greatly influences middle ear pressure. In cases of tubotympanic COM with inactive TM perforation, about one-third will have a normal functioning ET, and slightly less than half will have relatively mild ET dysfunction, according to Eustachian tube opening pressure.

THE MIDDLE EAR:

The TM, OW, FOS, and finally the cochlea serve as effective passive and linear transformers to transmit sound energy. The middle ear apparatus is made up of the TM, the ossicular chain, and the middle ear muscles. Its primary purpose is to fundamentally alter the sound energy by offering mechanical advantages to get around an impedance that the acoustic signal encounters when it travels from an air-filled medium (the middle ear cavity) to a fluid-filled media (the perilymphatic and the endolymphatic fluid in the cochlea).

Therefore, by this ossicular coupling, acoustic energy is essentially transmitted from a low-impedance, high-velocity medium to a high-impedance, low-velocity medium. The impedance differential is influenced by the ratio of the TM surface area to the footplate of the stapes, as well as by the lever effects of the membrane and ossicles. The ME and nasal cavity are connected via the Eustachian tube. This tube equalises pressure across the TM between the EAC and the middle ear as well as feeds air to the middle ear so that air particles can vibrate.

Impedance audiometry, which also evaluates compliance and pressure of the system through tympanometry, as well as the volume of the external auditory canal and stapedial reflex tests, is used to evaluate the middle ear. Tympanometry is essentially a measurement of the middle ear system's admittance (i.e., the reciprocal of impedance).

PHYSIOLOGY OF HEARING:

It is exceedingly challenging to evaluate the auditory sensitivity of patients with disease accurately, and as a result, prescribing digital amplification that is based on pure-tone thresholds may not produce the desired results. The cochlea can be directly stimulated by the bony skull made of canal, ossicles, and bony cochlea, within which the entire inner ear apparatus is enclosed, in addition to being stimulated through the stapes-oval window interface acoustic energy transfer and the round window effect. Airborne and internally produced sound waves cause the hard, bony skull to vibrate, which in turn can cause the cochlear basilar membrane (BM) to move endolymphatically and bypass the middle ear and external ear structures.

The acoustic energy that travels through the brain and cerebrospinal fluid (CSF) and is delivered to the cochlea through its fluid channels also travels over a non-osseous pathway that can be stimulated.

The SP level in bone canal vibrating the skull, ossicular inertia, the cochlear fluids, and the vibrations of the cochlear space all directly stimulate the cochlea. There are three techniques for stimulating bone:

- Because of the vestibular aqueduct's flexibility, vibrations can compress and deform the cochlear space, which is made up of the intralabyrinthine bone skeleton.
- Particle vibrations causing vibrations of the EAC, the tympanic bony sulcus, and directly conveyed to the cochlea.
- Vibration-induced inertia of the ossicles transferring to the bone labyrinth.

When both bone and air conduction are taken into account, the middle ear has a resonance frequency of between 1-3 kHz. The ossicular component of bone conduction as described above is put at risk if this resonance is decreased or damped by a mechanical issue in the ossicular chain (such as adhesion, fixation, or sclerosis), which results in a drop in the pure-tone thresholds as determined by BC of roughly 5-10dB. This is known as Carhart's notch in the BC thresholds in stapedial fixation, and it typically emerges at 2kHz.

However, a Carhart's effect with dips in BC thresholds may be present between 1 kHz and 4 kHz in any pathology affecting the ossicles. As the vibrations from the bone travel through the skull and re-enter the external ear, they are contained within the canal to directly stimulate the inner ear by the osseotympanic route and do not escape to the outside, which may result in improved bone-conduction thresholds with significant EAC obstruction.

The transfer of sound energy from external to inner ear:

By acting as a transformer, the middle ear raises SP at footplate of stapes in relation to that at the TM at the cost of a fall in stapes volume velocity in comparison to that at the TM. The ratio of TM area to stapes footplate area serves as main transformer mechanism in the ME (the area ratio).

In order to link to the stapes footplate, the TM first collects tension throughout the entirety of its surface. If the transformer action of area ratio is "perfect," the SP applied to IE by FOS should be 20 times greater—or 26 dB—than the SP at TM since pressure is defined as force per area, and the human TM has an area that is 20 times bigger than FOS.

Another transformer in the middle ear is the ossicular lever, which is created by the various measures of rotating malleus and incus arms along the axis of rotation of the ossicles. Axis of rotation is formed by AM ligament and incudal ligament, which anchor the short process of the incus. The lever actions of the malleus and incus in humans are roughly the same length. As a result, the ratio of their lengths, which is 1.3, predicts the stapes' capacity to produce a modest, 2-dB rise in SP. Theoretically, the ME SP gain would be roughly 28 dB if these transformers operated as intended.

A SOUND WAVE:

Something must vibrate in order to be a source of sound. Pressure waves are used to convey vibratory energy, or sound, from the source via the medium it is being communicated through. Because of this, sound waves cannot travel through a vacuum; instead, a physical medium is needed to carry the vibratory energy. Since most sounds are carried by the vibrations of air molecules to the ear, air is the most pertinent physical medium in the context of otolaryngology. Hearing is a result of vibrational energy reaching the ear and being registered there. As a result, knowledge of the physical characteristics of sound is necessary to comprehend how the ear perceives sound.

One may assume a scenario in which no force is applied to an area of air as a starting point. The air molecules are considered to be at ambient (or atmospheric) pressure in such a situation.

COM-MUCOSAL:

An intermittent or continuous, chronic purulent discharge from a perforated TM is referred to as COM, and it can be linked to cholesteatoma. An inactive COM, or persistent central perforation of the TM, might occasionally only have very infrequent intermittent discharge More frequently, exposure of the tympanic mucosa to germs from the external auditory canal and the eustachian tube causes chronic or recurring mucoid otorrhea, also known as active chronic otitis media.

P. aeruginosa is most typical bacterial isolate for COM. Aerobic organisms including Enteric gram-negative bacilli, S. aureus, Streptococci, K. pneumoniae, and H. influenzae are among the other isolates. Peptostreptococcus and Bacteroides species are examples of anaerobic isolates connected to an unpleasant otorrhea.

It is commonly accepted that episodes of acute otitis media (AOM) or OME in childhood frequently serve as the precursor to COM. OME may result in TM thinning, HL, poor verbal development, as well as other symptoms that might affect the child's scholastic development.

Histopathologically, COM can be identified by ME pathology including GT, cholesterol granulomas, or the development of cholesteatomas. Active COM is characterised by recurrent ear discharge caused by a chronic perforation of the TM and chronic inflammation of the ME and mastoid mucosa.

According to the WHO, between 65-330 million individuals worldwide have COM, of which 50% have HL. Complications from COM are also thought to be the cause of 28000 annual fatalities.

They also discovered that 21000 persons died every year from otitis media complications and that the prevalence of hearing impairment associated with OM is 30.8 per 10000.

In inactive mucosal COM or dry perforation, the ME and mastoid are not inflamed, but pars tensa has been permanently perforated. The mucocutaneous junction typically lies at the perforation margin, which may reach the fibrous annulus. Active mucosal COM is characterised by chronic inflammation of ME and mucosa of the mastoid, which may include submucosal fibrosis, hypervascularity, plasma cells, lymphocytes and histiocytes. Additionally, the ME epithelium exhibits basal cell hyperplasia and a rise in goblet cells.

GT, which has protruded through the perforated TM, can arise and is frequently clinically referred to as "aural polyps." Focal areas of cholesterol granuloma development can be seen in some regions with active COM which microscopically looks like a massive cell reaction encircling cholesterol clefts. Some surgeons believe that in order to manage the infection once a perforation has been repaired, it is essential to eliminate all of the inflamed epithelium and GT from the mastoid and ME area. Chronic inflammation can damage entire ME cleft, including the mastoid antrum. However, there is little solid data to support this, and many surgeons choose to just close the perforation in cases of active disease.

The ossicular chain is frequently destroyed in context of active tubotympanic type of COM. The afflicted ossicles often have hyperemic regions with capillary growth and noticeable GT.

In decreasing sequence of frequency, the long process of the incus, stapes crura, body of the incus, and manubrium are involved.

Young and middle-aged population of low socioeconomic status which result in poor hygiene, overcrowding is the most common suffers of COM.

The fluid-filled inner ear receives acoustic information from the air of the external environment. The relative impedances of air and fluid have a role in the transfer of sound power at an air-fluid contact. Only roughly 0.1% of an incident sound waves power density is transferred to fluid in the inner ear, which is equivalent to a 30-dB loss. By raising the SPs that travel to inner ear at specific frequencies, external and middle ears function to better match the sound-conducting qualities of air and cochlear fluid.

The sound that enters the ME is significantly influenced by the external ear. The EE acoustic function, sometimes referred to as external ear gain, is represented by a frequency- and direction-dependent change in SP at TM in comparison to SP in the free field. The external ear can gain up to 20 dB at 2500 Hz when a sound source is facing the ear, with less gain at lower and higher frequencies.

The TM and ossicular chain operate as primary means by which middle ear links sound signals from ear canal to cochlea.

AETIOLOGY OF CHRONIC OTITIS MEDIA-MUCOSAL:

The TM fails to mend after rupturing during an episode of AOM, which is usually accepted to be the cause of mucosal COM. Prior to the advent of vaccines, COM from single measles infection was frequent, research has observed, acute measles can result in NOM. Permanent perforation of the PT can also result after an unsuccessful myringotomy tube insertion into the TM.

When compared to ordinary grommets, long-stay ventilation tubes (T tubes) increase the probability of this happening; 2.2% of children treated with grommets experience a perforation, compared to 16.6% of children treated with T tubes.

Long-term ventilation had a 3.0 relative risk compared to simple grommets. The predisposing variables for both AOM and COM should be the same if COM is a sequela of AOM. COM would be more likely to develop if there is small but real chance that the TM won't mend after an episode of AOM, as the risk of perforation increases with each acute infection. There is evidence that the family size, the type of daycare, the sex, the duration of breastfeeding, the mother's socioeconomic situation, and prematurity all affect how AOM develops during the course of the first year of life. Given the evidence linking some of these factors to the development of COM, it would seem logical to presume that they are likely to be linked.

Surgery provides an option to medicinal care; in the right hands, about 80% of cases will remain dormant over the long term, and in many cases, this will be accompanied with an improvement in hearing.

It might be strongly argued that this rather than medical therapy should be the basis of management given that tympanoplasty represents the conclusion of more than 100 years of surgical advancement and the last stage in the surgical conquering of CHL.

Surgery is simpler to conduct and more likely to be effective if the ear is inactive, but not all patients would choose to have it, and there will always be patients for whom it is unsuccessful. If medical care with antibiotic/steroid ear drops is implemented in them, approximately 50% of ears will become inactive after a four- to six-week course, assuming medication compliance is greater than 70% and there is no open mastoid cavity.

However, the return rate is significant once medication is stopped, and symptomatically, a lot of patients would believe that dry mopping alone has cleared their discharge. Surgery is therefore likely to be the preferred course of treatment if the patient is willing and there are no contraindications.[20]

BURDEN OF HL:

EPIDEMIOLOGY:

HL is a widespread issue that affects people of all ages and can be very disabling and handicapping. WHO classifies HL as one of the top 20 diseases with the highest disease burden and as the main cause of disability worldwide. In 2012, the WHO estimated that 36 crore people worldwide had HL, which is 5.3% of the world's population. Of these, 91% are adults and 9% children. For both children and adults over the age of 65, the prevalence of debilitating hearing loss is highest in South Asia, the Asia Pacific, and Sub-Saharan Africa. The prevalence of hearing loss increases with age: in children it is 1.7%, 7% in individuals over the age of 15, and in adults over the age of 65 it is almost one in three.

The fact that primary prevention can prevent 50% of HL cases is important, nevertheless.[3] About 1 in 1000 children in the UK are born with a persistent hearing impairment, although this number roughly doubles throughout the early years of life. In 2011, there were roughly 10 million hearing-impaired individuals in the UK.

DISABLING HL AND ITS PREVENTION:

Disabling HL is referred as HL more than 40dB in the better ear in adults (15 years or older) and more than 30dB in the better hearing ear in children (0–14 years). The most of those who suffer from a HL that is incapacitating reside in developing nations. Three levels of preventive exist for any illness or disability:

• Primary prevention: This method entails reducing the root causes of the pathology being prevented.

• Secondary prevention: This is the control of handicap and disability in those who already have an impairment. This can be achieved by identifying those who are afflicted before they manifest clinically and, when appropriate, by offering treatment to halt the development of pathology and impairment.

• Tertiary prevention: This is the early care of the disability in order to prevent or limit the handicap.

SCREENING:

The New-born Hearing Screening programme was created in response to mounting evidence that early detection of deafness and early remediation can greatly improve outcomes for language development.

The World Health Organization suggested that all nations having access to rehabilitation services adopt the policy of universal neonatal hearing screening, and that this should be expanded to more nations and communities when rehabilitation facilities are created. Several industrialised nations around the world have already put this into practise.

In developing nations, putting it into practise might be difficult because of things like a lack of pricey screening equipment and skilled screening workers.

Since the bulk of births in many developing nations may occur outside of maternity hospitals, screening is frequently not done there by trained personnel and screening tools are not readily available. The age at which HL is discovered has drastically decreased in nations that have implemented universal neonatal hearing screening.

In England, median age at identification of permanent hearing impairment has come down from 18 months before the implementation of the screening to 10 weeks, with 90% of sufferers being recognised before the age of 6 months. In many developing countries, family suspicion remains the main mode of diagnosing childhood hearing impairment. Untreated HL that is present at birth or in the early years of life has a adverse impact on the language and the linguistic development, school performance, social and emotional growth. In countries without the worldwide new-born hearing screening programmes, a significant number of the kids with PCHI are not diagnosed until well into childhood.

It may take up to six years for a milder or solitary HL to be detected. The verbal and linguistic development, the performance in school, and the communal and emotive growth will all considerably benefit from the early identification and treatment of PCHI. Children with the HL can be identified through school screening in an efficient manner.

Even in nations where new born hearing screening is mandatory, school screening reveals kids who might have acquired HL later in life, have a progressive HL, or skipped the new born hearing test.

There are many preventable causes of HL, despite fact that it is one of the most common disabilities in the world. To lessen the effects of debilitating HL, health practitioners should continuously work to improve preventive medicine awareness and health education. Although significant progress has been made in the prevention of deafness throughout the years, much more needs to be done. Untreated otitis media can lead to the well-known complication of tympanic membrane perforation. It may appear alongside acute or chronic ear disorders. Excessive pressure on the TM, either from pressured purulent materials in the middle ear or from chronic eustachian tube dysfunction and its associated atelectasis, is a prevalent pathologic route.

The size of the ensuing defect may differ majorly on the organism's pathogenicity in addition typically appears in PT. Despite the fact that the majority of TM perforations spontaneously recover, some patients are left with a chronic hole in their eardrum. The typical presentation of a patient with a persistent perforation is a modest CHL, either with or without otorrhea. A TM perforation can cause HL which ranges from 0 to 40 dB, depending on condition of the ossicular chain. The otomicroscope works well for direct flaw visualisation. For the purpose of excluding occult cholesteatoma or possible ossicular pathology, careful binocular examination is crucial.

TM perforations result in CHL, which can be anywhere from insignificant and 50 dB. By losing the SP difference across the TM, a perforation reduces ossicular coupling, which is the main mechanism of conductive loss.

The major force behind motion of the ear drum and the ossicles is differential in sound compression through the TM.

It doesn't appear that perforation-induced physical alterations like reduced TM area or altered TM motion association to malleus significantly contribute to HL brought on by a perforation. Losses brought on by perforations are influenced by their frequency, size, and volume of ME air space.

HL is inversely dependent on the frequency with HL greater in low frequency and vice versa.[5,6,21] Irrespective of size of perforation, HL was the least for the frequency of 2000Hz.[9] The size of the perforation plays a significant role in HL; larger perforations result in greater HL.

Some studies claim that HL related directly to the size of the perforation rather than location of the perforation[5,6] but some suggest that clinically, it may be possible to foresee HL based on size of TM perforations[16] with HL is maximum in posterior quadrant[4,15,18] subtotal and marginal types[12] and malleolar perforation[7] associated with more severe HL than in ASQ, multiple quadrants, or non-malleolar perforations.[10,11]

Another crucial factor that determines degree of HL brought on by a perforation is the volume of ME air space; smaller ME air space volumes lead to larger A-B gaps. Under normal circumstances, resultant SP within ME cavity will vary inversely with ME volume for a given SP in EAC and certain perforation. Therefore, with smaller middle ear volumes, the transtympanic membrane SP difference will be the less. If the ME air space volumes are significantly varied, same perforations in two separate ears can have CHL that differ by up to 20 to 30 dB. There shouldn't be any systematic changes in the air-bone gaps generated by perforations of identical size at different places, as shown by the dependency of perforation-induced HL on the transtympanic membrane SP differential.

PURE-TONE AUDIOMETRY:

An audiometer is a piece of technology that generates pure tones that can have their intensity changed in 5 dB steps. For tones of 125, 250, 500, 1000, 2000, 4000, and 8000 Hz, AC thresholds are typically evaluated, while BC thresholds are assessed for tones at 250, 500, 1000, 2000, and 4000 Hz. The degree of HL at that frequency is determined by the amount of intensity that must be increased above normal. It is represented on a graph known 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 nontest 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 HL.

(b) A record may be preserved for the 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 THE HL:

HL is typically classified according to its severity: MiHL, MoHL, SHL, PHL. 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:

• MiHL: 21–40dB

• MoHL: 41–70dB

• SHL: 71–95dB

• PHL: 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 HL. However, for many numbers of reasons, they do not effectively convey effects of HL. In first place, HL frequently impacts hearing thresholds unevenly across frequencies for both right and left ear. (Fig 4).

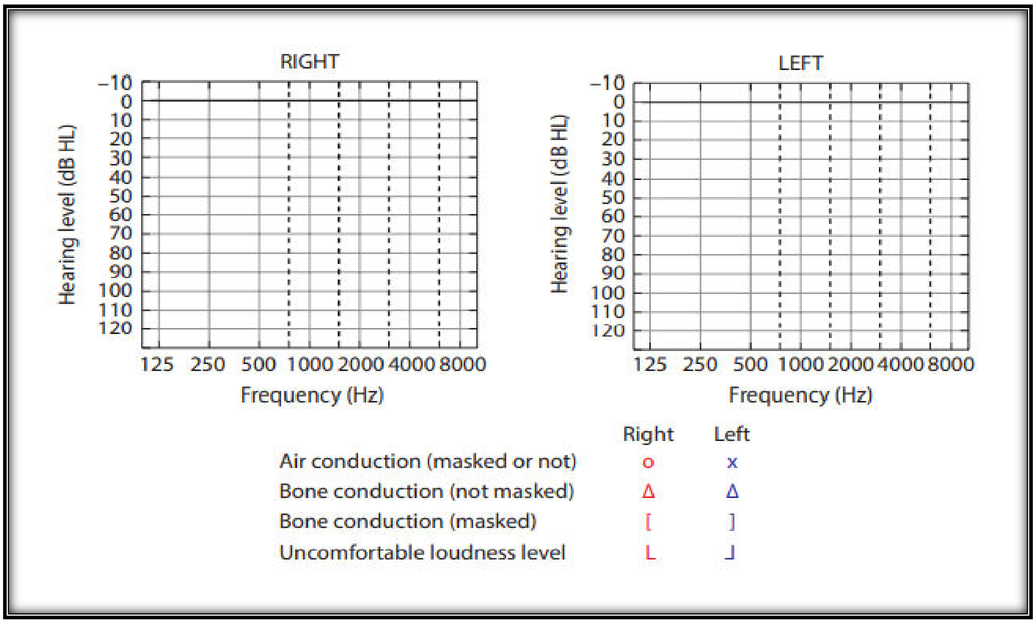


Fig 4 : PTA of the different frequencies for both Right and Left ear.[41]

TYPES OF HL:

As already mentioned, HL can be broadly divided into three types (Fig 5): CHL, SNHL, MHL or auditory neuropathy. When there is difference of more than 10 dB between the AC and BC thresholds at any frequency, a HL is categorised as "conductive," which is regarded as a severe ABG as described in the section above on measuring hearing thresholds. In cases of CHL, 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.

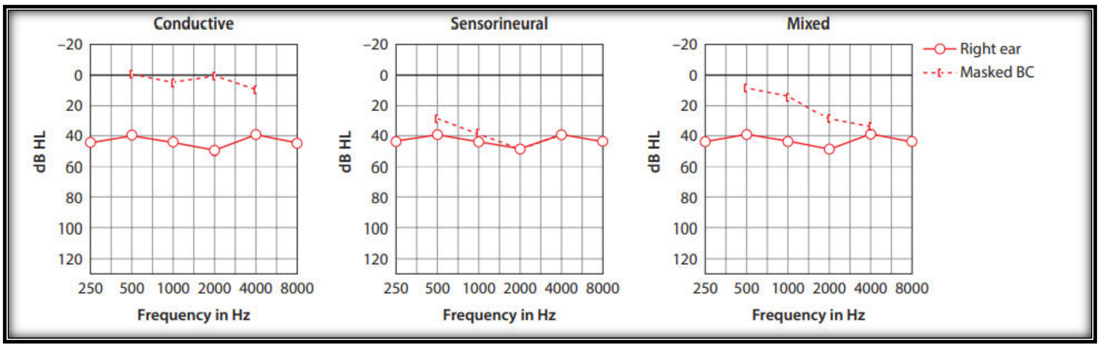


Fig 5: Classification of types of HL.[41]

Disruptions to the middle and/or external ear's transmission processes result in CHL. CHL, for instance, is brought on by conditions such as fluid in the ME or anomalies of the TM or ossicles. When there is full audibility of signal, CHL 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 CHL. 60dB HL is typically accepted as upper limit of CHL.

Nevertheless, regardless of volume of the sound, the extent of the HL attenuates (reduces) all sounds equally, so overall auditory deprivation caused by CHL may be more than that caused by SNHL with loudness recruitment at a similar level. Children with CHL may perceive sound patterns inconsistently due to the fluctuating nature of their HL, which reduces their chances of identifying well-known sound patterns. CHL loss is quite prevalent and can also be found alongside SNHL based on the cochlea, leading to a MHL which is caused by the very high incidence of ME pathology in infants. Many CHL 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 SNHL. SNHL describes a dysfunction of cochlea and/or direct nerve connections. Severity of the SNHL 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.

The AC and BC thresholds on the audiogram are within 10dB of one another, indicating SNHL. Remember that a 15 dB difference between AC and BC thresholds is frequently observed but does not signify a CHL due to an artefact in the standards for BC thresholds at 4000Hz. Be advised that the some low-frequency BC signals may be felt as the vibrations in those with MoHL to PHL, creating appearance of a MHL at low frequencies. Individuals may experience bone conductor vibrations as low as 25 dB at 250 Hz, 55 dB at 500 Hz, and 70 dB at 1000 Hz depending on their sensitivity to sound. In mild or severe cochlear-based disability, the options for medicinal or surgical therapies are extremely constrained. Many SNHL cases are treated with the hearing aids.

COM denotes an ongoing disease of the PT or PF, almost certainly brought on by an earlier episode of the AOM, negative ME pressure, acute OME. CSOM which was once used to describe the condition, is no longer recommended because COM is not always caused by "the collection of pus."

It is still possible to distinguish between the active and the inactive COM, where there is no inflammation or the pus production but there is a chance that ear could become active at some point in the future.

Healed COM is a third clinical condition in which the pars tensa has permanent abnormalities, but pars tensa is intact and pars tensa and flaccida have not significantly retracted, preventing the ear from becoming active. Successful surgery can also result in "healed COM." Earlier, primarily anatomical distinction between "tubotympanic" and "atticoantral" sickness has been rendered obsolete by our modern ability to precisely evaluate a person's ear, particularly under magnification. It is inaccurate and deceptive to use the labels "safe" and "unsafe" because issues might arise from any ear with the active COM, regardless of pathophysiology.

Even while the CHL was shown to be the most prevalent, the prevalence of SNHL and MHL demonstrates that we cannot completely rule out inner ear involvement in mucosal disease. The duration of ear discharge also has a big impact on how much HL there is; prolonged ear discharge, higher severity of HL there is. As severity of illness grew, HL increased. HL is greater as the volume of the ear reduces.[4,8] It is predicted that there would be very few spatial changes in the ME air-space pressure as a result of the hole site since the wavelengths of audible sound are substantially bigger than the dimensions of TM.[6] At frequencies of 100 Hz and 10,000 Hz, the wavelengths of sound are 3,400 mm and 34 mm, respectively. The holes are substantially closer spaced than these wavelengths because the largest dimension across TM is only 10 mm.[8]

OTOENDOSCOPY:

Otology was one of the first surgical specialties to employ minimally invasive techniques because of the use of the microscope and micro tools. The benefits of using an operating microscope are clear: it gives the surgeon full use of both hands while providing a stable image in the familiar head-on view with adjustable magnification. In contrast to the endoscope, which can manoeuvre around anatomical corners to provide a wide and varied direction of view, the microscope's straight-line vision is also its principal drawback. The study of middle ear anatomical features has a new tool thanks to contemporary advancements in endoscope design, and more difficult applications include neuro-otological procedures like the removal of acoustic neuromas. With more otologists using the endoscope to some level during an otologic procedure, there is currently a range of approaches between entirely microscopic ear surgery and totally endoscopic ear surgery.

HISTORY OF OTOENDOSCOPY:

Although Hopkins created the fiber-optic endoscope in 1954, Long's use of the fiber-optic hypodermic microscope in 1965 marked the beginning of otoendoscopy. 2 Merin's further forays into the middle ear space in 1967 faced logistical challenges with moving the large mass of the microscope. The ME spaces and their significance were the subject of in-depth research by Proctor, Donaldson, and Wigand at around the same time. They paid particular attention to the sinus tympani, epitympanic sinus, and protympanum, which were the anatomical blind spots for the operating microscope.

DIGITAL CAMERA SPECIFICATIONS:

Otoendoscopy requires a high-quality Hopkins rod, but it also requires a high-quality digital camera that is mounted to the endoscope. One of the most crucial factors is to choose a camera with three charge-coupled devices (CCDs) instead of a single CCD camera, which can only detect one-third of the colour information for each pixel. Each CCD measures the primary colours, red, green, or blue, separately for each pixel. Generally speaking, three CCD cameras offer greater image quality thanks to improved resolution and reduced image noise. When utilised in a tiny region with a lot of bleeding, single CCD cameras are prone to "red-out." Even if there isn't much bleeding during EES, the field often turns red and the camera becomes completely saturated. The entire area takes on an orange tint that makes it extremely difficult to identify anatomical features.

IMAJE J SOFTWARE:

The video-otoscope modified for computers A low-cost, dependable, technology-driven, clinical method for quantitatively analysing TM perforations and perforation is measured using the Image J software. For the Macintosh, NIH image served as inspiration for the public domain Java image processing tool known as Image J. It can be downloaded or executed as an online software on computer that has a Java 1.1. Using the IMAGE J software, the total proportion of extent of perforation (P/QX100) of each ear was determined by calculating percentage of perforation (P) and area of the complete TM (Q).

We are doing this study to investigate location, size and duration of TM perforation in addition to its association with the type, frequency, and degree of HL in patients with COM.

MATERIALS AND METHODS

STUDY DESIGN: A hospital based one-year prospective observational Study.

STUDY PERIOD: 1st January 2021 to 31st December 2021.

STUDY POPULATION:

Patients of both sexes having diagnosed clinically with Chronic Otitis Media between the age group of 18 to 60 years who will be ready to undergo Otological examination, Oto-endoscopic examination and Pure Tone Audiometry in K.L.E.S. Dr. Prabhakar Kore Hospital and Medical Research Centre, Belagavi.

SAMPLING PROCEDURE:

After taking informed consent from the patient, their details and a thorough clinical history will be obtained including the duration of HL. All patients will be clinically examined including general physical examination and careful examination of the ear, nose and throat. Otoscopic examination and tuning fork tests will be performed. Oto-endoscopic examination will be done and the status of the tympanic membrane, size and site of perforation in pars tensa of tympanic membrane will be documented.

The photography of the perforation will be taken and later assessed in Image J software, a freely available software in NML website.[2]

Hearing assessment will be done with MAICO™ MA53 audiometer.

The hearing threshold for Pure Tone audiometer will be determined in a sound treating room at frequencies ranging from 125 - 8000 Hz for air conduction and 250 - 4000 Hz for bone conduction.

INSTRUMENTS USED FOR DATA COLLECTION:

1. Welch Allyn otoscope.
2. MAICO^{TM} MA53 audiometer.
3. Karl Storz 0-degree endoscope.

INCLUSION CRITERIA:

1. Patients in the age group belonging to 18 to 60 years.
2. All cases of COM who presented with dry TM perforations in pars tensa.
3. Patients willing to give written and informed consent to undergo Otological examination, Oto-endoscopic examination and pure tone audiometry.

EXCLUSION CRITERIA:

1. Patients below 18 years of age.
2. Patients above 60 years of age
3. Presence of GT or mucosal oedema.
4. Presence of ossicular chain disruption and cholesteatoma.
5. Active ear discharge of COM, SNHL, atticoantral type of COM.
6. Patients not willing to give written and informed consent.

STUDY METHOD:

Otoendoscopy was done using zero-degree endoscope and the picture of the perforation saved with USB TV Box.

The site of perforation was noted anterior or posterior to handle of malleus (Image1). The images were analyzed using 'IMAGE J' software.

Pixel measurements were used to determine the size of the perforation and the overall size of the tympanic membrane. The ratio of area of the perforation (P) (Image 2) to area of the tympanic membrane (Q) (Image 3) was calculated as percentage using the formula P/Q×100.

Image 1: Image showing perforation of TM

Hearing assessment is done using MAICOTM MA53 audiometer.

Image 2: Image showing the area of perforation(P)

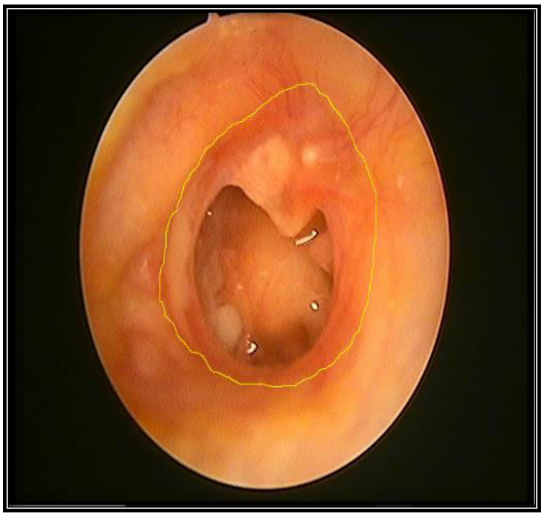
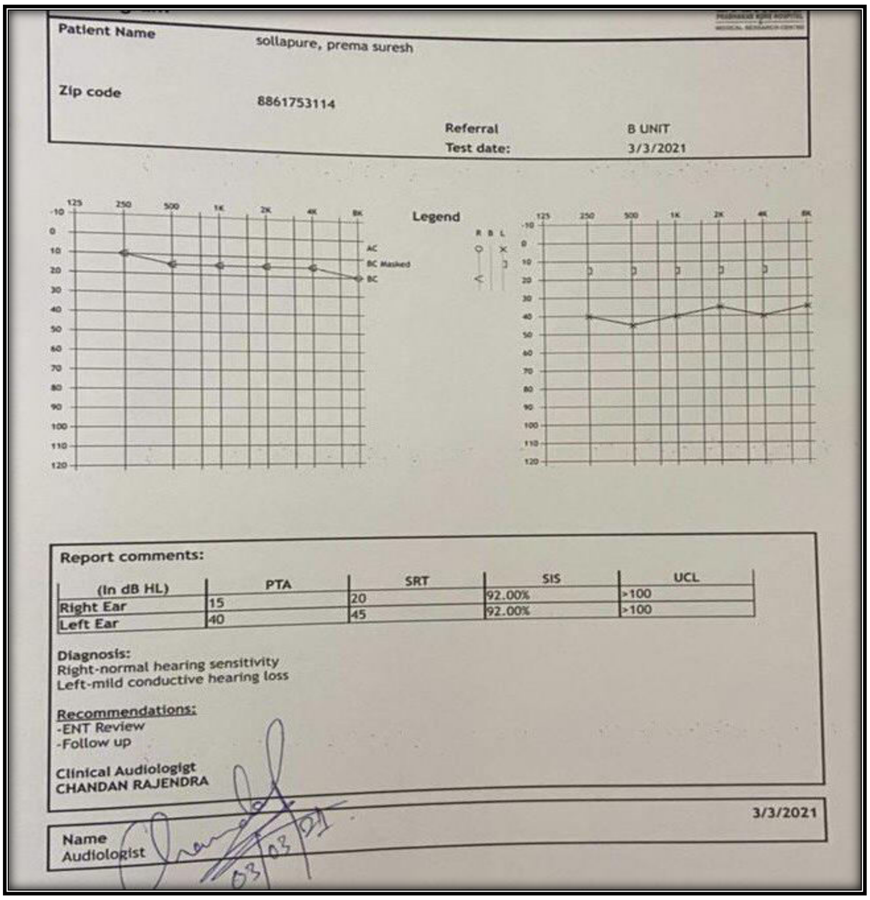


Image 3: Image showing the total area of the perforation(Q)

The hearing threshold for Pure Tone audiometer (Image 4) will be determined in a sound treating room at frequencies ranging from 125 - 8000 Hz for air conduction and 250 - 4000 Hz for bone conduction.



Patient Name sollapure, prema suresh

Zip code 8861753114

Referral B UNIT

Test date: 3/3/2021

Report comments:

(In dB HL)	PTA	SRT	SIS	UCL
Right Ear	15	20	92.00%	>100
Left Ear	40	45	92.00%	>100

Diagnosis:
Right-normal hearing sensitivity
Left-mild conductive hearing loss

Recommendations:
-ENT Review
-Follow up

Clinical Audiologigt
CHANDAN RAJENDRA

3/3/2021

Name
Audiologist

Image 4: Image showing PTA

RESULTS

One hundred thirteen tympanic membrane perforations were studied in the department of Otorhinolaryngology and Head & Neck Surgery of KAHER'S Jawaharlal Nehru Medical College from January 2021 to December 2021. All observations recorded in the study are described under the following headings.

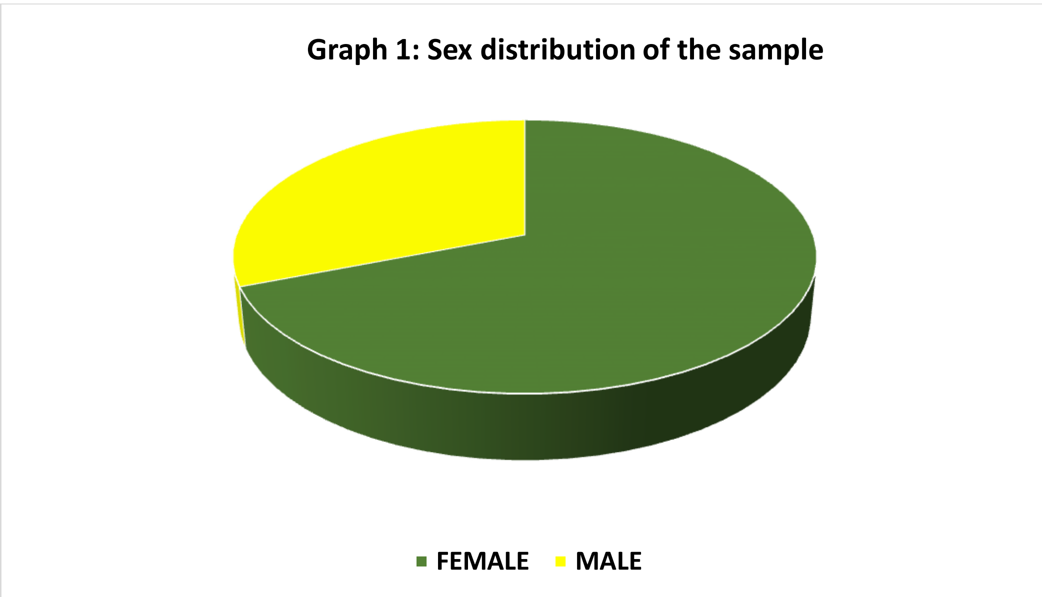
Sex distribution:

A total of 113 ears from 95 patients with tympanic membrane perforation in either or both ears were studied.

There were 35 males (30.97%) and 78 females (69.03%).

Table 1- Sex distribution of the sample

Gender	Number	%
Female	78	69.03
Male	35	30.97
Total	113	100.00



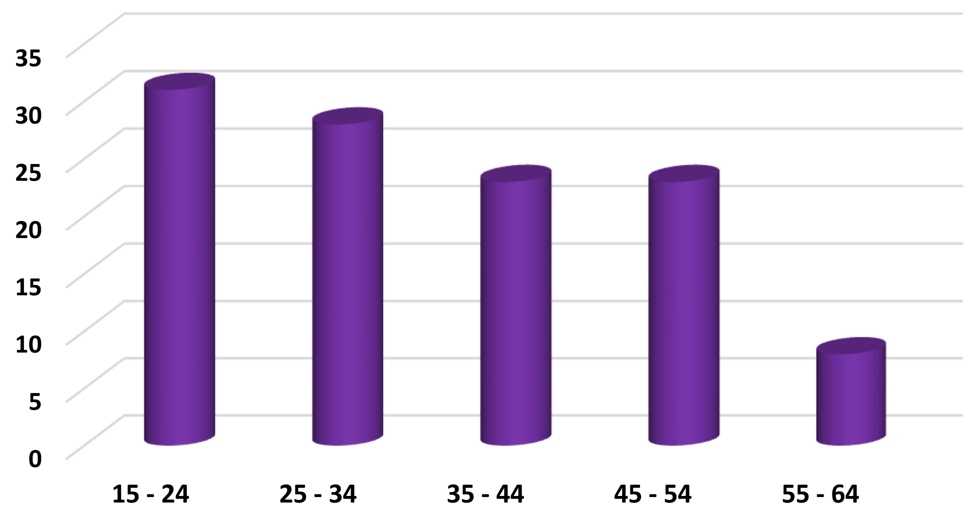
Age distribution of the sample:

Ages from 18 – 60 years, with mean age of 35.46 ± 12.12 years.

Table 2- Age distribution of the sample.

Age	Number	%
15 – 24	31	27.43
25 – 34	28	24.78
35 – 44	23	20.35
45 – 54	23	20.35
55 – 64	8	7.08
Total	113	100.00
Mean	35.46	
S.D.	12.12	

Graph 2- Age distribution of the sample



Size of the perforation and side of the perforation:

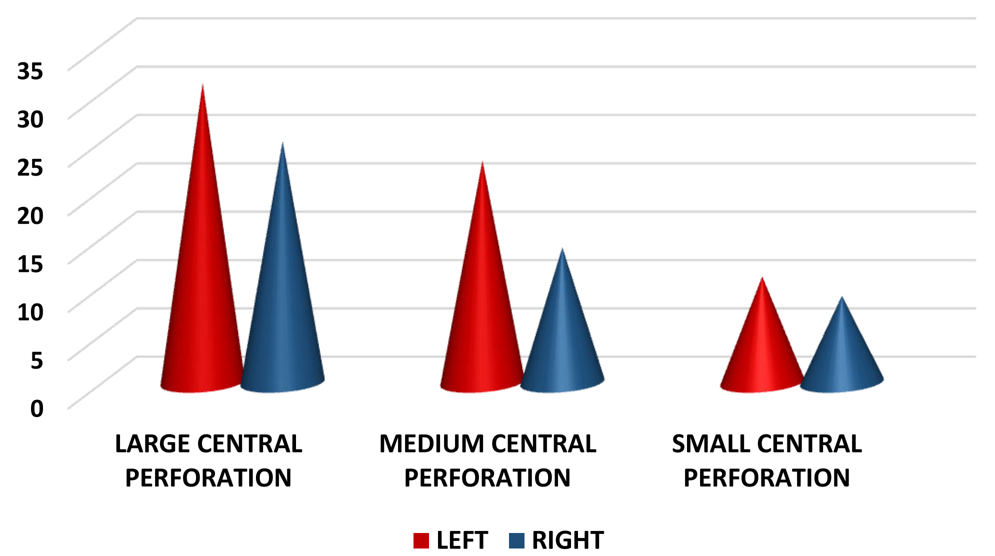
Most common is the large central perforation and least common is the small central perforation.

Therefore, size of the perforation has no predilection to the side of the ear.

Table 3: Size of perforation and site of perforation

Size of perforation	Side		Total	%
	Left	Right		
Large central perforation	31	25	56	49.56
Medium central perforation	23	14	37	32.74
Small central perforation	11	9	20	17.70
Total	65	48	113	100.00

Graph 3: Size of perforation with side of perforation



Distribution of the HL with duration of ear discharge:

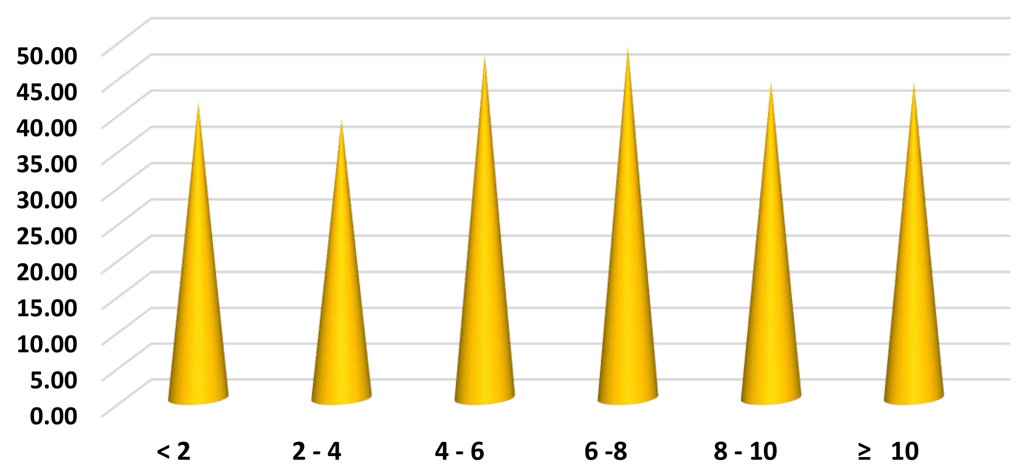
The mean HL is 43.66 dB. HL does not increase with the duration of the ear discharge.

TABLE 4: Distribution of hearing loss with the duration of ear discharge.

Duration (years)	Number	%	HL (dB)	
			Mean	S.D.
< 2	6	5.31	41.00	13.15
2 - 4	23	20.35	38.70	12.64
4 - 6	15	13.27	47.53	19.50
6 -8	4	3.54	48.75	11.09
8 - 10	6	5.31	43.83	6.49
≥ 10	59	52.21	43.78	14.94
TOTAL	113	100.00	43.66	14.16

Using one way analysis of variance (ANOVA) the value of p is 0.5179.

Graph 4: Distribution of hearing loss with the duration of ear discharge.



Distribution of site of the perforation with side of the perforation:

In both right and left ears, perforation of the tympanic membrane was more commonly seen in anterior quadrant. However, perforations were more commonly observed in the left ear compared to the right ear.

Table 5: Distribution of site of the perforation with side of the perforation.

Site	Side				
	Right	%	Left	%	Total
Anterior	14	36.84	24	63.16	38
Posterior	4	57.14	3	42.86	7
Both	30	44.12	38	55.88	68
Total	48	42.48	65	57.52	113

The value of p using chi-square test is 0.5530.

Distribution of type of the HL with size of the perforation:

Overall, CHL was more common in 80 patients (70.80%). In small central perforations, CHL was more common and in large central perforations MHL was more common.

Table 6: Distribution of type of hearing loss with size of the perforation.

Size	Type of hearing loss				
	CHL	%	MHL	%	Total
Small	43	89.58	5	10.42	48
Medium	29	65.91	15	34.09	44
Large	8	38.10	13	61.90	21
Total	80	70.80	33	29.20	113

The value of p using chi-square test is 0.0001.

Distribution of degrees of the HL with site of the perforation:

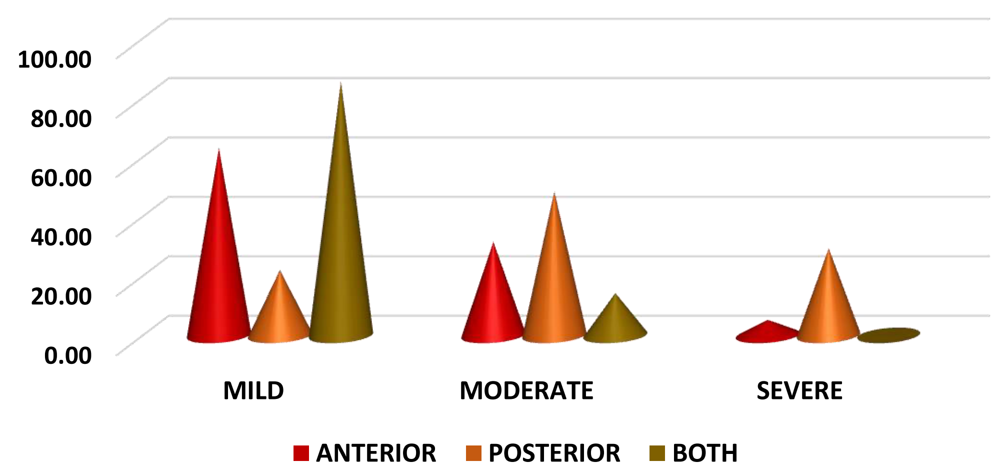
The commonest HL in anterior located perforation was MiHL. The commonest HL in posterior located perforation was MoHL. Overall, HL was more in severity when perforation was located in the posterior quadrant and on further analysis, among the posterior quadrant perforations HL was comparatively more when perforations were located in the PSQ than when located in the PIQ.

Table 7: Distribution of degrees of the HL with site of the perforation.

Site	HL						
	MiHL	%	MoHL	%	SHL	%	Total
Anterior	24	63.16	12	31.58	2	5.26	38
Posterior	15	22.06	33	48.53	20	29.41	68
Both	6	85.71	1	14.29	0	0.00	7
Total	45	39.82	46	40.71	22	19.47	113

The value of p using chi-square test is less than 0.0001

Graph 5: Distribution of degrees of hearing loss with site of the perforation.



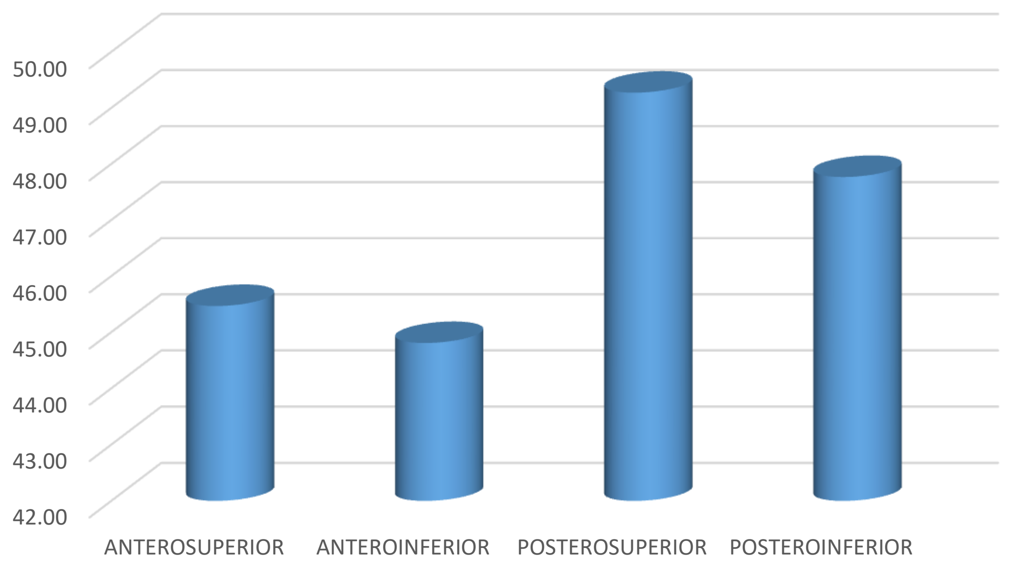
Correlation with site of the perforation with the HL(dB):

There is a significant difference between the means of AIQ and PSQ. The highest HL is seen in PSQ with the mean HL of 49.27dB. However, there is very minimal difference of the mean value of 1.5dB with PIQ.

Quadrant	Hearing loss(dB)			
	Mean	S.D.	Min	Max
ASQ	45.47	13.52	21	86
AIQ	44.81	14.20	20	86
PSQ	49.27	12.78	28	86
PIQ	47.77	13.99	20	86

The value of p for the above table, using one way analysis of variance, is 0.0491.

Graph 6: Correlation with site of the perforation with the hearing loss(dB)



Correlation with size of the perforation with degree of HL(dB):

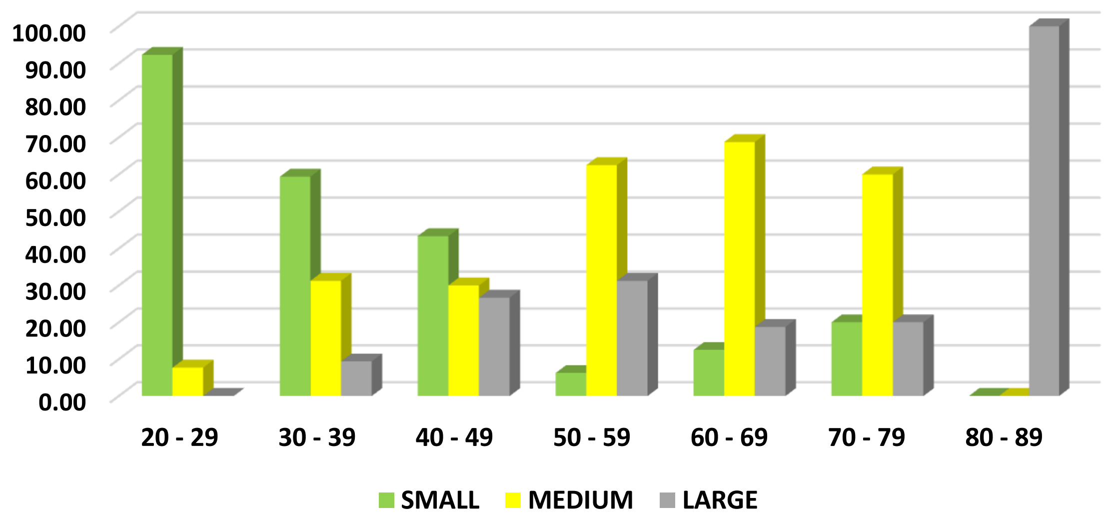
There is a significant association with degree HL (dB) and of size of perforation. The degree HL (dB) increases with the increased size of the perforation.

Table 9: Correlation with size of perforation with degree of HL(dB).

PTA (dB)	Size of perforation						Total
	Small 0-24 (%)	%	Medium 25 - 49 (%)	%	Large ≥ 50 (%)	%	
20 - 29	12	92.31	1	7.69	0	0.00	13
30 - 39	19	59.38	10	31.25	3	9.38	32
40 - 49	13	43.33	9	30.00	8	26.67	30
50 - 59	1	6.25	10	62.50	5	31.25	16
60 - 69	2	12.50	11	68.75	3	18.75	16
70 - 79	1	20.00	3	60.00	1	20.00	5
80 - 89	0	0.00	0	0.00	1	100.00	1
TOTAL	48	42.48	44	38.94	21	18.58	113

The value of p using chi-square test is 0.0001.

Graph 7: Correlation with size of the perforation with degree of hearing loss(dB).



DISCUSSION

HL is a nationwide problem with significant physical and psychosocial problem, so it is very important to diagnose the perforation of TM. Perforation of TM is common in otologic practice which can result from variety of causes, the most common being infections and trauma. Infections like acute otitis media, chronic otitis media, tuberculosis, trauma like barotrauma, temporal bone fracture, iatrogenic (ventilation tubes). Perforation size is an important determinant of the hearing loss; larger perforations result in larger hearing losses, more so when located in PI quadrant.

The present study is done to assess hearing status in patients TM perforation and its correlation with the size and site of the tympanic membrane perforation.

In our study, 93 patients with 113 ears with perforation of TM were examined.

TM perforation was seen in female predominance in 78 ears (69.03%) and in male, 35 ears (30.97%). This may probably be from the speculation that in the developing countries, females tend to seek medical attention more often than males. The reasons behind this notion are not fully substantiated.

Age group was divided into 5 groups i.e. age ranging from15 – 24 years, 25 – 34 years, 35 – 44 years, 45 – 54 years and 55 – 64 years. The majority of patients were seen in the age group of 25 – 34 years. This showed that the youths were more socially active and aware of the social implications of HL.

Oto - endoscope assessment of the type of TM perforation showed that the Large central perforation was seen most commonly seen in 56 ears (49.56%) i.e. 31 left ears and 25 right ears with the mean size ranging from 43.48% ± 12.48% followed by Medium central perforation seen in 37 ears(32.74%) i.e. 23 left ears and 14 right ears with the mean size ranging from 22.27% ± 11.31% followed by Small central perforation seen in 20 ears(17.70%) i.e. 11 left ears and 9 ears with the with the mean size ranging from 16.65% ± 19.69%.

The duration of ear discharge was divided into 6 groups i.e. < 2 years in 6 ears(5.31%) with mean HL(dB) ranging from 41.00 ± 13.15, 2 – 4 years in 23 ears(20.35%) with the mean HL(dB) ranging from 38.70 ± 12.64, 4 – 6 years in 15 ears(13.27%) with mean HL(dB) ranging from 47.53 ± 19.50, 6 – 8 years in 4 ears(3.54%) with mean HL(dB) ranging from 48.75 ± 11.09, 8 – 10 years in 6 ears(5.31%) with mean HL(dB) ranging from 43.83 ± 6.49, >10 years in 59 ears(52.21%) with mean HL(dB) ranging from 43.78± 14.94.

CHL was the most commonly seen in 80 ears (70.79%) with Mild CHL seen in 44 ears, Moderate CHL seen in 28 ears, Moderately severe CHL seen in 4 ears and Severe CHL seen in 4 ears.

MHL was seen in 33 ears (29.20%) with Mild MHL is seen in 8 ears, Moderate MHL is seen in 12 ears, Moderately severe MHL is seen 6 ears and Severe MHL is seen in 7 ears.

The degrees of HL were divided into MiHL, MoHL and SHL. Severe degree of HL is seen in Posterior quadrant.

The sites of perforation were divided into AS, AI, PS and PI. The highest HL is seen in PSQ with the mean HL of 49.27dB followed by PIQ with the mean HL of 47.77dB. There is a minimal hearing difference of mean HL of 1.5dB.

HL is less in Small central perforations and more in Large central perforations. The HL increases with increased size in perforation.

In the present study, size of perforation is statistically significant with HL and PSQ perforation showed greater HL. Nepal et al (2008)[12] in their study concluded that HL was found to be directly proportional to the size of perforation irrespective of their cause, which was statistically significant and perforations involving PIQ were found to have maximum HL.

We analysed One hundred thirteen cases in which perforation involving PSQ has the mean HL of 49.27 dB and PIQ has mean HL of 47.77 dB. One hundred forty-five cases of chronic suppurative otitis media with central perforations and intact, mobile ossicles were clinically analyzed by Durko et al (1997)[42] concluded that hearing loss in perforations involving posteroinferior quadrant was found to be upto 30 dB while in rest of central perforations average of 20 dB conductive hearing loss was found. Berger et al(1997)[43] in the same year in his study over 120 cases also found of all locations, perforations involving the posteroinferior quadrant of the ear drum were associated with largest A-B gap.

In our study, larger HL was seen in posteriorly located perforations. Likewise, posterior quadrant perforations having greater HL than anterior ones were revealed by Yung MW et al (1983) [44] in the study of 100 cases. Ahmad (1979)[32] and friends studied 70 cases with the similar results. Additionally, they also observed that malleolar and marginal holes caused a larger loss of hearing than comparable central and non-malleolar perforations of the same size.

In the study conducted by Kumar et al(2011)[10], they observed that malleolar perforations had significantly greater hearing loss than non-malleolar perforations. This finding does not coincide with the observation made by Pyne and Githler (1951)[45], that hearing loss is greater in perforations not touching manubrium than that of perforations touching it. However, our findings are consistent with those of several authors who discovered increased hearing loss in malleolar perforations.

According to Kumar et al(2011)[10] findings, in this respect could not confirm conclusively the view of all other investigators who stated that the site is an important determinant of the HL and more HL results from posterior perforations than from anterior ones. Whereas findings were more in line with Austin (1978)[46]; who upheld an opinion that perforations resulting from disease show little difference in the HL due to site of perforation.

According to Rana et al (2019)[4], perforations involving posterior half of TM showed more loss than those involving anterior or inferior half of membrane statistically which is similar to our study.

According to our study, perforations located in posterior quadrants has more SHL. Mehta et al (2006)[5] in their study concluded that the perforations in anterior versus posterior quadrants showed no significant differences in air-bone gaps at any frequency, although the anterior perforations had an average air-bone gaps that were smaller by 1 to 8 dB at the lower frequencies and HL will not depend on location of the TM perforation.

In the present study, severe degree of HL is seen in posterior quadrant located perforations. According to Bandaru et al(2019)[9] the study observed no significant difference in the magnitude of HL based on site of perforation of TM which implies that there is no significant relationship between the site of perforation and the degree of HL. Similar results were also shown by Sood As et al(2018)[24] and Ibekwe TS et al(2008)[21] who observed no relation between location of perforation and magnitude of HL.

Our study was similar to Maharajan et al(1970)[19] and Berger et al(1997)[43] who observed statistically significant relation with the site of perforation and the magnitude of HL, which is maximum for posterior quadrant perforation. This can be explained on basis that the posterior or PIQ perforations expose RW directly to sound waves, then sound would travel to both windows at same time and cancel each other. This is known as Baffle Effect, where HL is out of proportion to size of perforation.

Our study was similar to study conducted by Darad et al(2017)[22] where the HL was found to be more in posterior perforations and HL resulting from malleolar than non-malleolar perforation.

In the present study, HL is more when perforation is located in posterior quadrant but according to Voss et al (2011)[23] and Saliba et al(2011)[25] HL does not depend on perforation location.

In our study, Severe degree of the HL is seen in posteriorly located perforations whereas according to study conducted by Sood et al (2018)[24] did not find any significant difference in the degree of hearing loss between anterior and posterior perforation and also did not find any significant correlation between either duration and size of tympanic membrane perforation or between duration and the degree of hearing loss.

Our study was similar to the study conducted by Lavanya et al (2021)[26], Dudda et al (2018)[27] and Mirza et al(2019)[29] concluded that HL increased with the size of perforation and with posterior location of TM perforation.

Sharma et al (2020)[28] noted that HL due to TM perforation is usually a CHL and greater the percentage of the surface area of the TM that is lost, more severe is the degree of deafness which was similar to study conducted by us whereas according to Sharma et al(2020)[28] and Ahmad et al(1979)[32] , amongst the perforations located in the inferior quadrants of the tympanic membrane, the ones located in the posteroinferior quadrant cause greater degree of deafness than the anteroinferior quadrant perforations but in our study the greater hearing loss was seen in posterosuperior quadrant.

In the present study, HL does not increase with the duration of ear discharge. Ritesh et al(2022)[30] , Rafiq et al(2014)[34] and Prasansuk et al(1982)[39] showed that the average HL increased significantly as duration of disease increased.

In the analysis of present study, the HL is more in LCP than in medium and small size perforation which was similar to Bibek et al(2022)[31].

Our study was similar to Mohammed et al(2017)[33] and Dessai et al(2017)[18] noted that the level of HL was proportionately related with size of the TM perforation. Moreover, the posterior sited perforation had greater impact on the threshold of the hearing than those with anterior sited perforation.

In the present study, there was a significant correlation between size of the perforation and HL. Fernando et al(2014)[35] reported that there was no correlation between the size of tympanic membrane perforations in simple chronic otitis media and hearing loss at 500 Hz; 1000 Hz; 2000 Hz and 4000 Hz.

Our study noted that the HL is more when the perforation is located in posterior quadrant. According to Bob Lerut et al(2012)[36], there was a linear relationship between size of perforation and CHL does exist as a general rule.

Our study was similar to the study conducted by Anthony et al(1972)[37] found that the average loss for all perforations was minimal in the order of 20 dB, being more marked in the lower frequencies and gradually becoming less in the high frequencies. A greater loss in the low frequencies in the posterior inferior quadrant when compared to the anterior inferior quadrant.

Our study was similar to the study conducted by Kharadi et al(2014)[40] mentioned that perforations occupying all four quadrants, perforations occupying 50-75% of vibratory surface area of tympanic membrane had significantly greater hearing loss and posterior perforations cause more hearing loss than anterior perforations.

CONCLUSION

TM perforations owing to COM are widespread in our field, they could be ascribed to risk factors such as low SES resulting in poor cleanliness and overcrowding.

Tympanic membrane perforation is very common in day-to-day practice. Hence, it is very important to a surgeon to make an observation of size and location of the perforation and assess HL.

One hundred thirteen ears with tubotympanic type of COM with variable age and sex were examined in present study. Location of the perforation was noted, the size of perforation was measured using Image J software and PTA was conducted to assess type and the degree of HL.

In our study we observed that the tubotympanic type of COM is more common in females with age ranging from 18-60 years. Unilateral ear involvement was more commonly observed and majority of the cases included left sided ear.

In our study we observed large central perforation was most commonly seen and least commonly seen was small central perforation.

HL is greater at lower frequencies than higher frequencies. With an increase in the perforation size, the HL becomes severe. The HL was seen maximum when all four quadrants of the TM was involved.

The perforation of TM was found to be located at different sites. Site of perforation is also an important factor as posterior quadrant pars tensa perforations have greater hearing loss than anterior quadrant perforations. The HL in our study is maximum when perforation is located in PSQ and minimum in AIQ.

The analysis on duration of the disease with HL did not show significant difference. HL does not increase with increased duration of ear discharge.

In our study, SCP had CHL and LCP had MHL. However, the CHL is the predominant type of HL associated with COM tubotympanic type.

The CHL in anteriorly located perforations was MiHL while posteriorly located perforations had MoHL. Overall, severity of HL is greater in perforations located in posterior quadrants compared to anterior quadrants.

Significant auditory loss can be avoided if COM patients are detected early and treated appropriately.

SUMMARY

This study was conducted in the "Department of Otorhinolaryngology and Head and Neck Surgery, Jawaharlal Nehru Medical college and K.L.E.S. Dr. Prabhakar Kore Hospital from January 2021 to December 2021. The goal of this study was to find out if the site, size and duration of the tympanic membrane perforations is related with the hearing loss.

A chronic inflammation of the ME and mastoid cavity is known as COM. Developing countries are primarily affected by this condition. Recurrent otorrhoea caused by a TM perforation and CHL of variable degrees are the clinical characteristics.

Our study included one hundred thirteen ears from ninety-five patients with tympanic membrane perforation in one or both ears were examined. The sample distribution was 78 females (69.03%) and 35 males (30.97%) with ages ranged from 18 – 60 years, with a mean age of 35.46 ± 12.12 years.

The large central perforation is the most common type seen in 56 ears (49.56%), whereas the small central perforation is the least commonly seen in 20 ears (17.70%).

Left side ear was most common involved in 65 patients (57.5%). As a result, the size of the perforation has no preference for either side of the ear.

The distribution of the HL is compared with duration of ear discharge. The ear discharge duration was divided into 6 groups i.e. <2 years, 2-4 years, 4-6 years, 6-8 years, 8-10 years and >10 years. The average HL is 43.66 dB. With ear discharge, HL does not get worse over time.

The anterior quadrant of the TM was more often perforated in 63.16% of both the right and left ear. However, compared to the right ear, perforations were more frequently seen in the left ear. (57.52%)

CHL was more common in 43 ears having small central perforations while MHL was more common in 13 ears having large central perforations. Overall, CHL was more prevalent in 80 ears (70.80%). TM perforation and ossicular chain changes often result in CHL in COM.

MiHL was found in 24 ears, accounting for 63.16% of all anteriorly situated perforations. MoHL was found in 33 ears (48.53%) of all posteriorly located perforations. Overall, perforation in the posterior quadrant of tympanic membrane caused HL to be more Severe.

The means of the AIQ and the PSQ differ significantly. On further investigation revealed that among perforations in posterior quadrant of TM, HL was comparatively greater when perforations were located in the PSQ than when located in the PIQ. With a mean HL of 49.27dB, the PSQ shows the greatest HL. However, there is only a 1.5dB difference in the mean value with the PIQ.

The size of perforation and HL (dB) are significantly correlated. The larger perforation, the greater HL (dB).

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ANNEXURE I

INFORMED CONSENT

"ASSESSMENT OF HEARING STATUS IN PATIENTS WITH TYMPANIC MEMBRANE PERFORATION AND IT'S PARAMETERS IN CHRONIC OTITIS MEDIA - A ONE YEAR PROSPECTIVE OBSERVATIONAL STUDY IN KLES DR PRABHAKAR KORE HOSPITAL AND MEDICAL RESEARCH CENTRE.''

PRINCIPAL INVESTIGATOR: REGISTRATION NO: BE0120010

Post-Graduate student, Department of Otorhinolaryngology and Head and Neck Surgery, J.N.Medical College, KAHER, Belagavi 590010.

CO-INVESTIGATOR: DR. RAJENDRA B. METGUDMATH

Professor, Department of Otorhinolaryngology and Head and Neck Surgery, J.N.Medical College, KAHER, Belagavi 590010.

INTRODUCTION AND PURPOSE:

The present study is conducted among patients with tympanic membrane perforation patients attending the out-patient department of ENT & HNS in KLE's Dr. Prabhakar Kore Hospital and Medical Research Centre, Belagavi and will be investigated for Otological examination, oto-endoscopic examination and pure tone audiometry. You are requested to participate in the study and your participation is completely voluntary.

PROCEDURE:

If you agree to participate in this study, the relevant data will be collected as per the proforma and the final diagnosis will be confirmed. After getting inducted in the study, you will be evaluated for hearing status with Otological examination, oto-endoscopic examination and Pure tone audiometry. Patient will also be investigated for the site and size of the perforation and the same will be studied.

BENEFITS:

Patient will not be eligible for any kind of monetary benefits or free services by virtue of your participation in the study.

RISKS:

Methods applied to do the study are safe.

COST OF PARTICIPATION:

The cost of the Investigation will be borne by the Study Subject. The other indirect expenses will be borne by the Investigator.

PRIVACY AND CONFIDENTIALITY:

The results of the study may be published in journals for scientific purposes. However, your identity will not be revealed. All information collected will be coded so that no one other than the investigator will know your identity.

WITHDRAWAL FROM THE STUDY:

You can withdraw from the study at any time if you wish to do so.

AUTHORIZATION TO PUBLISH THE RESULTS:

The researcher may use the information gathered from this study for presentation in scientific meetings. However, your identity will not be revealed.

QUERIES AND CONTACT:

If you have any queries regarding the study, you can contact REGISTRATION NO: BE0120010 without any hesitation and the guide Dr. _______________, If you have any questions about rights as a research participant you can contact Dr Harsha Hegde, Chairperson, JNMC, IEC & Scientist D, ICMR, National Institute of Traditional Medicine.

CONSENT SUMMARY:

I have been explained all the contents of this consent form in my local language and having understood and clarified all my queries about the study to the best of my knowledge, I hereby give my voluntary consent for participation in the study. I do sign the informed consent form in front of an eyewitness whom I recognize.

Name and Signature/ left thumb impression of the participant:

Legally authorised Relative:

Name and Signature/ left thumb impression of the eyewitness (Relative):

Name and signature of the interviewer:

Signature of the guide:

Date:

ANNEXURE II

PROFORMA FOR DATA COLLECTION

ASSESSMENT OF HEARING STATUS IN PATIENTS WITH TYMPANIC MEMBRANE PERFORATION AND IT'S PARAMETERS IN CHRONIC OTITIS MEDIA - A ONE YEAR PROSPECTIVE OBSERVATIONAL STUDY IN KLES DR PRABHAKAR KORE HOSPITAL AND MEDICAL RESEARCH CENTRE.

Date:

Name:

Age:	OP/IP no:
Sex:	Date of assessment:
Address:	Date of discharge:
Occupation:	Diagnosis:

CLINICAL PROFILE:

Chief Complaint:

History of Present Illness

Past History:

Personal History:

Family History:

I) <u>General Physical Examination:</u>

Blood Pressure:

Pulse:

Respiratory Rate:

Pallor
Icterus
Clubbing
Cyanosis
Lymphadenopathy
Edema

II) <u>ENT Examination:</u>

1. <u>EAR EXAMINATION</u>:

	Right	Left
• Pinna		
• Pre auricular area		
• Post auricular area		
• External auditory canal		
• Tympanic membrane		

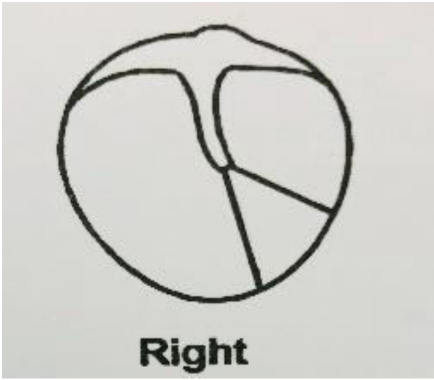
<u>TUNING FORK TESTS:</u>

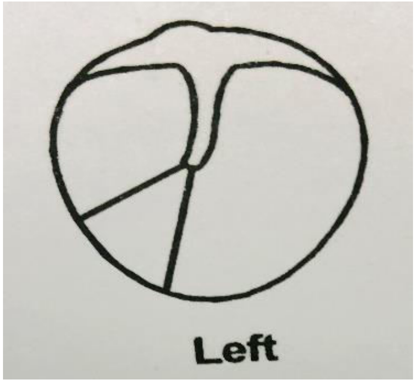
- Rinne's test 256 Hz
  512Hz
  1024 Hz

- Weber's test
- Absolute Bone Conduction test:

<u>FACIAL NERVE EXAMINATION</u>:

1. OTO-ENDOSCOPY EXAMINATION:

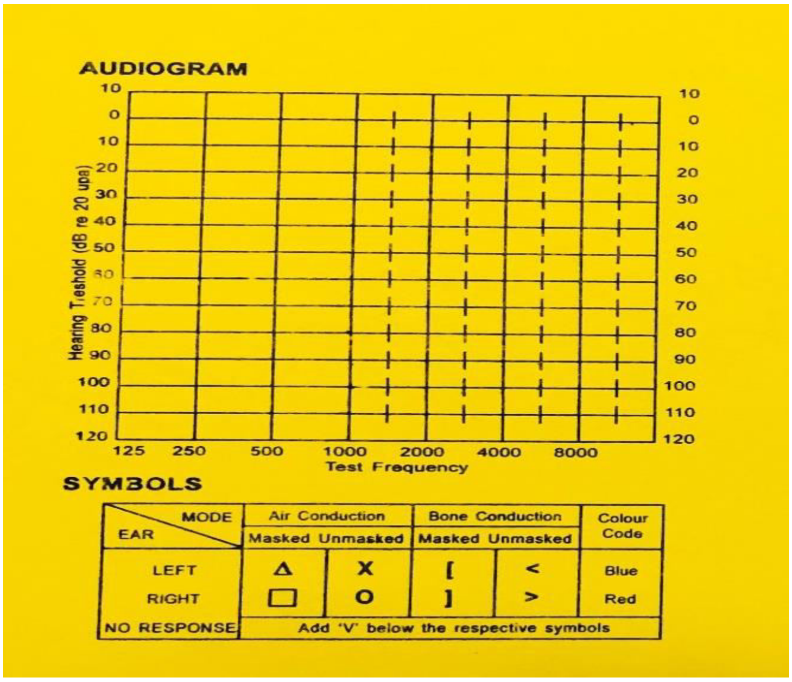




2. J IMAGE SOFTWARE:

Total area of Tympanic membrane is 90 mm^2.

3. PURE TONE AUDIOMETRY:



2. NOSE EXAMINATION:

External appearance

Root

Bridge

Dorsum

Alae

Tip

Columella

Cold spatula test

Anterior Rhinoscopy

Posterior Rhinoscopy

Paranasal Sinus Tenderness Examination

3. THROAT EXAMINATION:

DIAGNOSIS:

ANNEXURE III – PHOTOGRAPHS

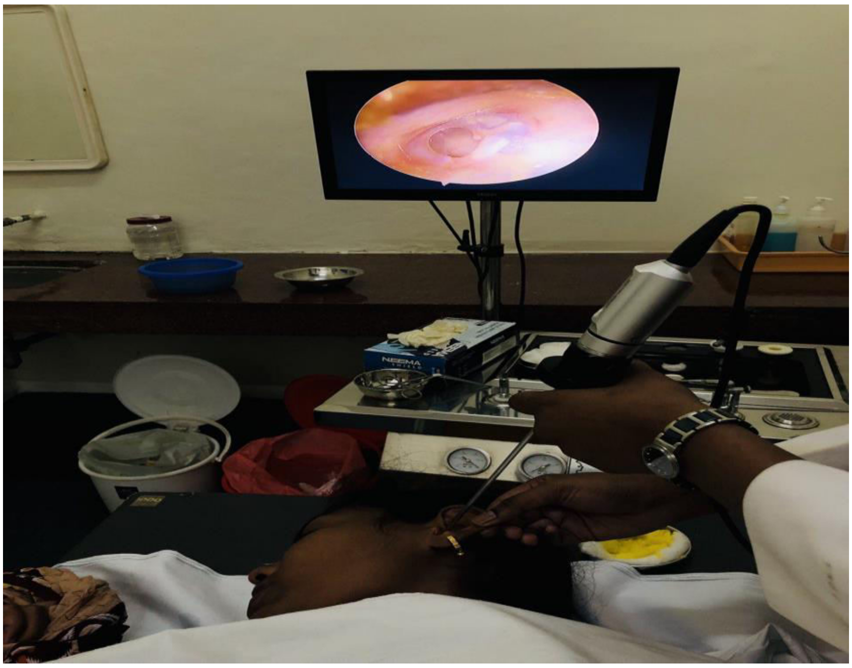


Image 5: Performing Otoendoscopy on a patient.

Image 6: Small central perforation in Anteroinferior quadrant of Right ear.

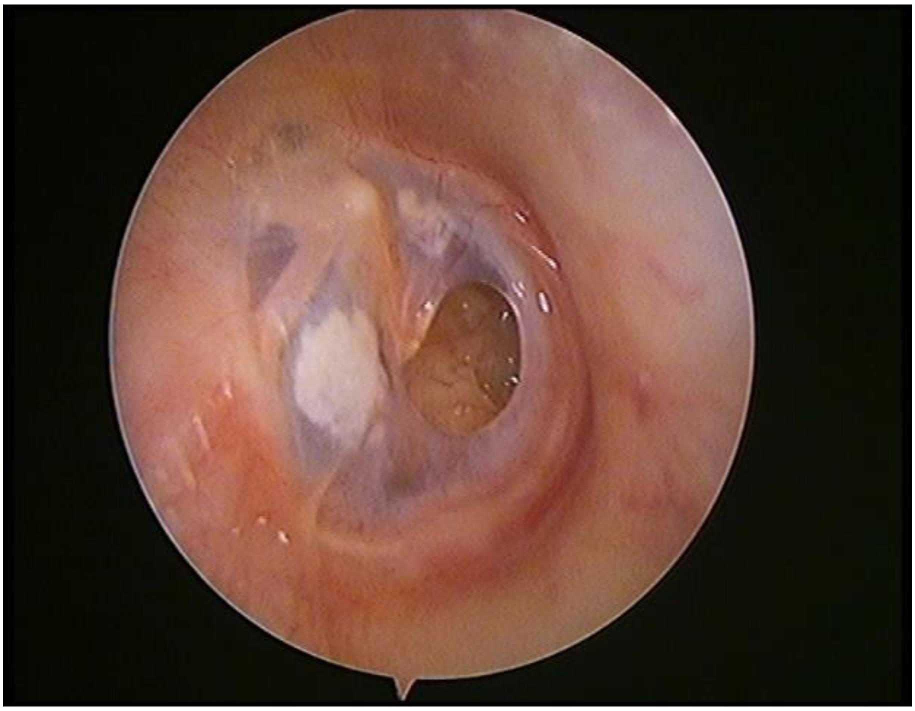


Image 7: Small central perforation in Posteroinferior quadrant of Left ear.

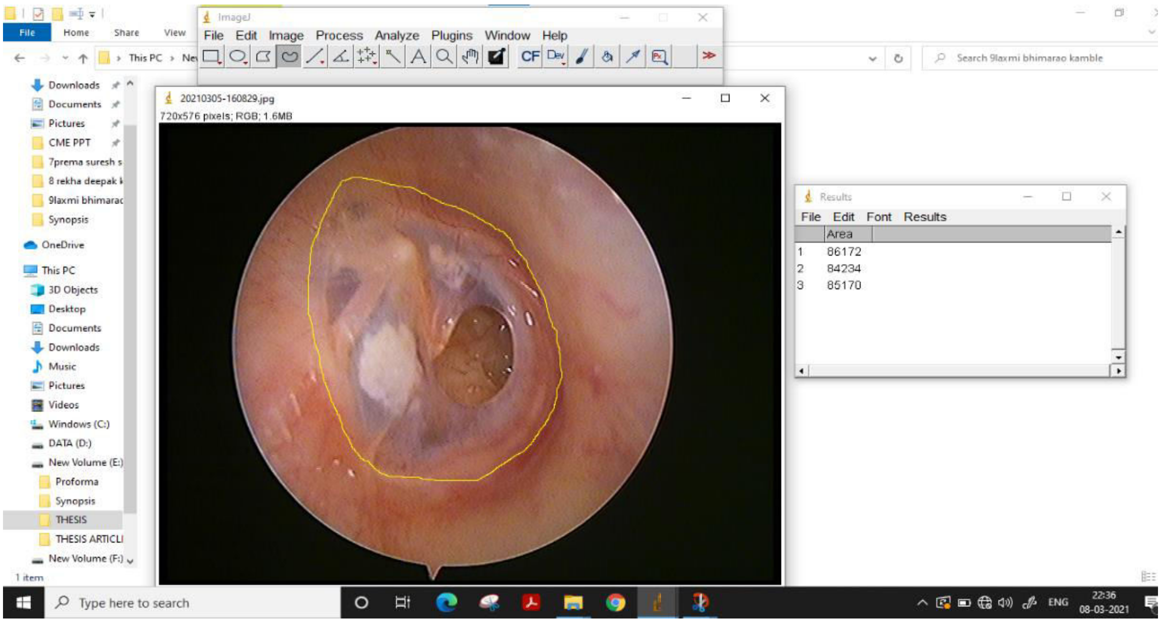


Image 8: Measuring the total area of tympanic membrane using Image J software.

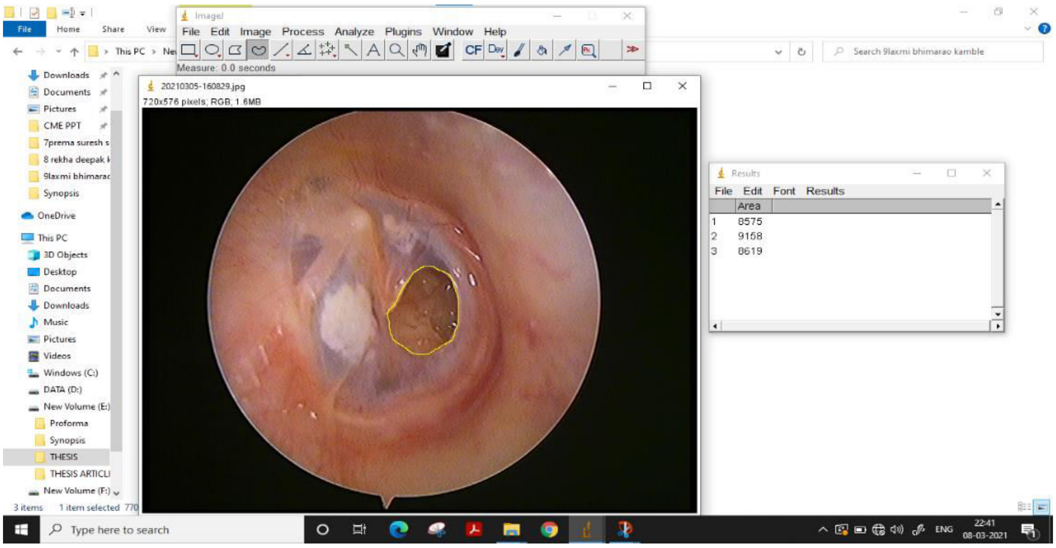


Image 9: Measuring the area of the perforation using Image J software.

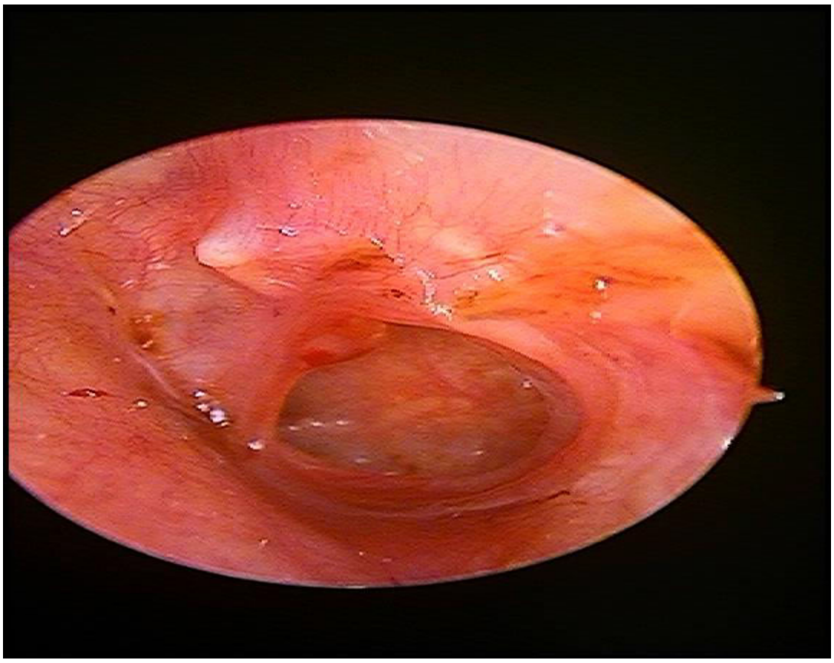


Image 10: Medium central perforation in Anteroinferior and Posteroinferior quadrants of Left ear.

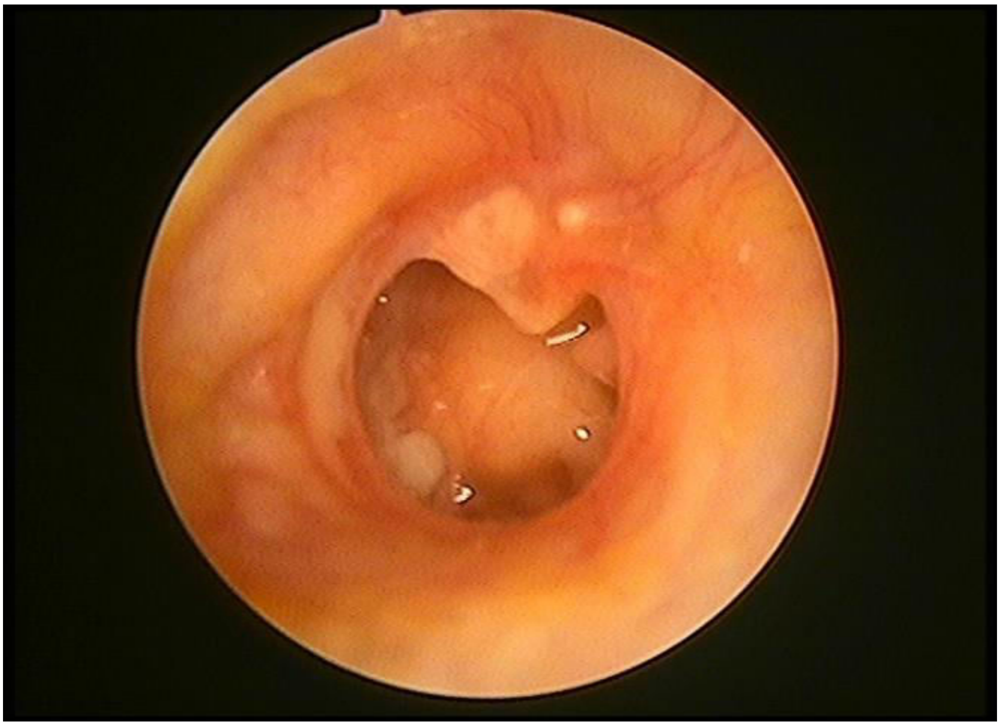


Image 11: Large central perforation in all quadrants of Right ear.

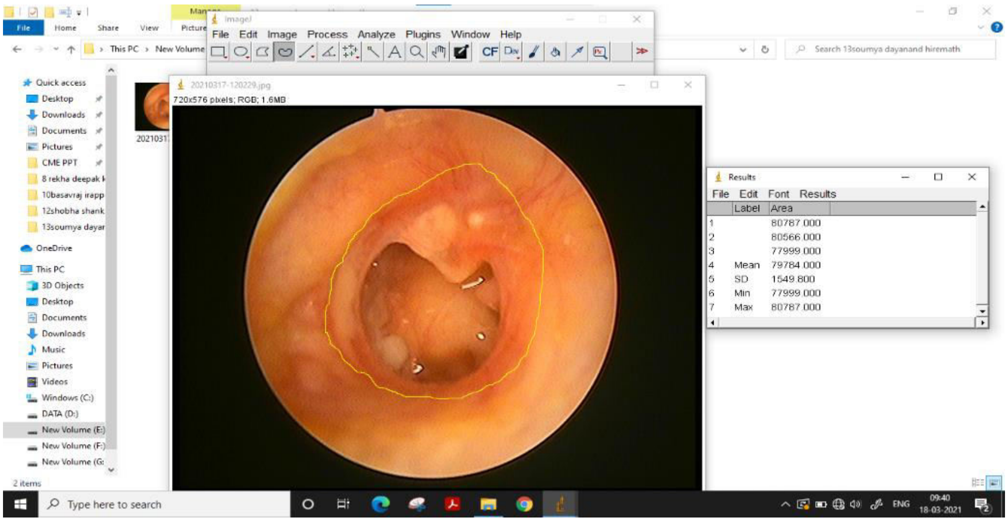


Image 12: Measuring the total area of tympanic membrane using Image J software

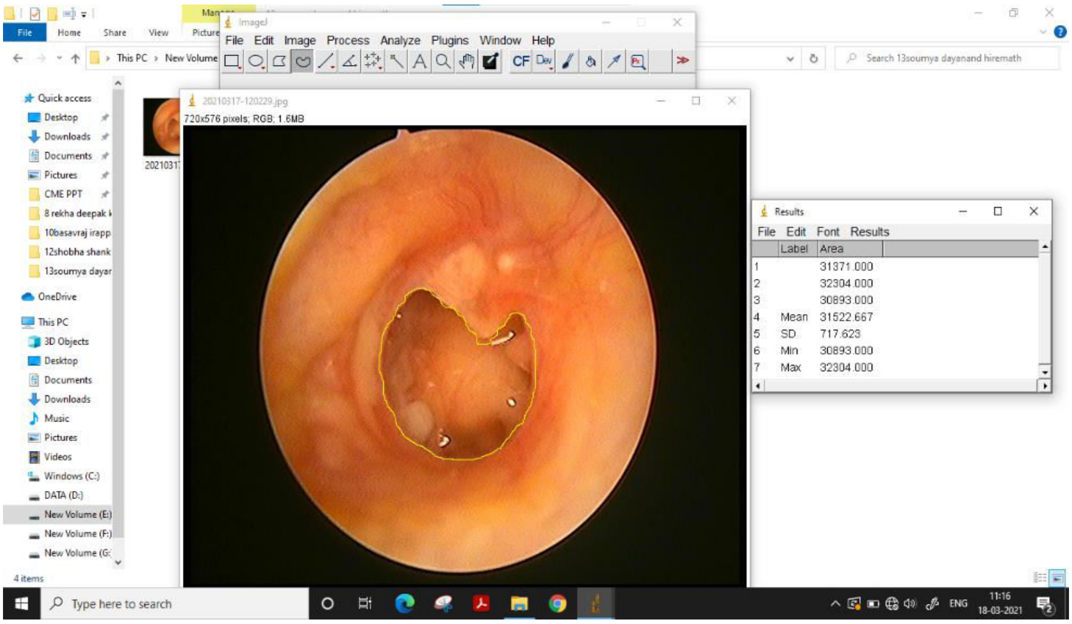


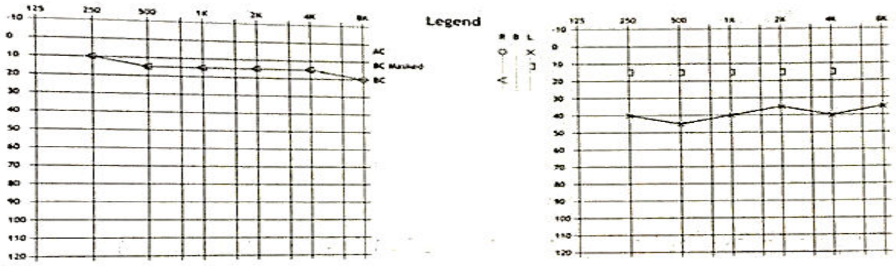
Image 13: Measuring the area of the perforation using Image J software.

Image 14: Audiologist conducting Pure Tone Audiometry.

Patient Name sollapure, prema suresh

Zip code 8861753114

Referral B UNIT
Test date: 3/3/2021



Report comments:

(In dB HL)	PTA	SRT	SIS	UCL
Right Ear	15	20	92.00%	>100
Left Ear	40	45	92.00%	>100

Diagnosis:
Right-normal hearing sensitivity
Left-mild conductive hearing loss

Recommendations:
-ENT Review
-Follow up

Clinical Audiologigt
CHANDAN RAJENDRA

Name
Audiologist 3/3/2021

Image 15: Pure Tone Audiometry of a patient.

ANNEXURE IV

KEY TO MASTER CHART

Age: in years

Sex: Male and Female

Side of perforation: Right ear or Left ear

Duration: in years

Type of perforation: Small central perforation, Medium central perforation and Large central perforation.

Quadrants involved: Anterosuperior, Anteroinferior, Posterosuperior and Posteroinferior.

Size of the perforation: in percentage

Hearing loss: in decibel

Type of hearing loss: Conductive or Mixed.

Degree of hearing loss: Mild or Moderate or Severe

OP/IP NO	AGE	SEX	SIDE OF PERFORATION	DURATION (in years)	TYPE OF PERFORATION	QUADRANTS INVOLVED	SIZE OF PERFORATION	PTA FINDINGS	TYPE OF HEARING LOSS	HEARING LOSS (in dB)	DEGREE OF HEARING LOSS
6683192	36Y	F	LEFT	CHILDHOOD	MEDIUM CENTRAL PERFORATION	ANTEROSUPERIOR & ANTEROINFERIOR	17%	LEFT MILD CONDUCTIVE HEARING LOSS	CONDUCTIVE	36	MILD
6682974	56Y	F	RIGHT	4Y	LARGE CENTRAL PERFORATION	ANTEROSUPERIOR, ANTEROINFERIOR. PSOTEROSUPERIOR AND POSTEROINFERIOR	51%	RIGHT SEVERE MIXED HEARING LOSS,	MIXED,	86	SEVERE
6682974	56Y	F	LEFT	4Y	LARGE CENTRAL PERFORATION	ANTEROSUPERIOR, ANTEROINFERIOR. PSOTEROSUPERIOR AND POSTEROINFERIOR	45%	LEFT SEVERE MIXED HEARING LOSS	MIXED	75	SEVERE
6683052	45Y	M	RIGHT	1Y	MEDIUM CENTRAL PERFORATION	ANTEROINFERIOR & POSTEROINFERIOR	11%	RIGHT MODERATE MIXED HEARING LOSS	MIXED	45	MODERATE
6683096	32Y	F	LEFT	CHILDHOOD	MEDIUM CENTRAL PERFORATION	ANTEROSUPERIOR & ANTEROINFERIOR	4%	LEFT MILD CONDUCTIVE HEARING LOSS	CONDUCTIVE	22	MILD
1034751	62Y	M	LEFT	3Y	LARGE CENTRAL PERFORATION	ANTEROSUPERIOR, ANTEROINFERIOR. PSOTEROSUPERIOR AND POSTEROINFERIOR	26%	LEFT MODERATE MIXED HEARING LOSS	MIXED	42	MODERATE
6688383	19Y	M	LEFT	CHILDHOOD	LARGE CENTRAL PERFORATION	ANTEROSUPERIOR, ANTEROINFERIOR. PSOTEROSUPERIOR AND POSTEROINFERIOR	56%	LEFT MODERATE CONDUCTIVE HEARING LOSS	CONDUCTIVE	42	MODERATE
1026991	32Y	F	LEFT	CHILDHOOD	MEDIUM CENTRAL PERFORATION	ANTEROSUPERIOR & ANTEROINFERIOR	26%	LEFT MILD CONDUCTIVE HEARING LOSS	CONDUCTIVE	40	MILD
6688447	35Y	F	RIGHT	3Y	SMALL CENTRAL PERFORATION	ANTEROSUPERIOR	2%	RIGHT MILD CONDUCTIVE HEARING LOSS	CONDUCTIVE	45	MILD
6682764	40Y	F	RIGHT	5Y	MEDIUM CENTRAL PERFORATION	ANTEROSUPERIOR & ANTEROINFERIOR	10%	RIGHT MILD CONDUCTIVE HEARING LOSS	CONDUCTIVE	30	MILD
1037653	23Y	M	RIGHT	1Y	SMALL CENTRAL PERFORATION	POSTEROINFERIOR	6%	RIGHT MILD CONDUCTIVE HEARING LOSS	CONDUCTIVE	35	MILD
1046234	44Y	M	LEFT	CHILDHOOD	LARGE CENTRAL PERFORATION	ANTEROSUPERIOR, ANTEROINFERIOR. PSOTEROSUPERIOR AND POSTEROINFERIOR	28%	LEFT MODERATE MIXED HEARING LOSS	MIXED	50	MODERATE
6526038	42Y	F	LEFT	CHILDHOOD	LARGE CENTRAL PERFORATION	ANTEROSUPERIOR, ANTEROINFERIOR. PSOTEROSUPERIOR AND POSTEROINFERIOR	44%	LEFT MODERATE MIXED HEARING LOSS	MIXED	55	MODERATE
6686872	18Y	F	LEFT	CHILDHOOD	LARGE CENTRAL PERFORATION	ANTEROSUPERIOR, ANTEROINFERIOR. PSOTEROSUPERIOR AND POSTEROINFERIOR	40%	LEFT MODERATE CONDUCTIVE HEARING LOSS	CONDUCTIVE	50	MODERATE
6759082	18Y	M	RIGHT	4Y	LARGE CENTRAL PERFORATION	ANTEROSUPERIOR, ANTEROINFERIOR. PSOTEROSUPERIOR AND POSTEROINFERIOR	43%	RIGHT MODERATE CONDUCTIVE HEARIG LOSS	CONDUCTIVE	43	MODERATE
1136787	48Y	F	LEFT	10Y	MEDIUM CENTRAL PERFORATION	ANTEROSUPERIOR & ANTEROINFERIOR	7%	LEFT MODERATE MIXED HEARING LOSS	MIXED	45	MODERATE
1095732	52Y	M	LEFT	CHILDHOOD	MEDIUM CENTRAL PERFORATION	ANTEROINFERIOR & POSTEROINFERIOR	18%	LEFT MILD CONDUCTIVE HEARIG LOSS	CONDUCTIVE	30	MILD
1782654	38Y	F	LEFT	3Y	LARGE CENTRAL PERFORATION	ANTEROSUPERIOR, ANTEROINFERIOR. PSOTEROSUPERIOR AND POSTEROINFERIOR	25%	LEFT MODERATE MIXED HEARING LOSS	MIXED	50	MODERATE
6697634	26Y	F	LEFT	2Y	SMALL CENTRAL PERFORATION	ANTEROSUPERIOR	3%	LEFT MILD CONDUCTIVE HEARING LOSS	CONDUCTIVE	30	MILD
6735098	21Y	F	LEFT	10Y	MEDIUM CENTRAL PERFORATION	ANTEROINFERIOR AND POSTEROINFERIOR	20%	LEFT MILD CONDUCTIVE HEARING LOSS	CONDUCTIVE	20	MILD
6208653	18Y	F	RIGHT	CHILDHOOD	MEDIUM CENTRAL PERFORATION	POSTEROINFERIOR & ANTEROINFERIOR	34%	RIGHT MODERATE CONDUCTIVE HEARIG LOSS	CONDUCTIVE	43	MODERATE
6380956	42Y	F	LEFT	5Y	MEDIUM CENTRAL PERFORATION	ANTEROSUPERIOR & ANTEROINFERIOR	15%	LEFT MILD CONDUCTIVE HEARING LOSS	CONDUCTIVE	30	MILD
1537267	31Y	F	RIGHT	8Y	MEDIUM CENTRAL PERFORATION	ANTEROINFERIOR & POSTEROINFERIOR	58%	RIGHT MODERATE CONDUCTIVE HEARING LOSS	CONDUCTIVE	50	MODERATE
1137756	44Y	F	RIGHT	12Y	LARGE CENTRAL PERFORATION	ANTEROSUPERIOR, ANTEROINFERIOR. PSOTEROSUPERIOR AND POSTEROINFERIOR	36%	RIGHT MILD MIXED HEARING LOSS	MIXED	35	MILD
1036527	55Y	F	LEFT	3Y	MEDIUM CENTRAL PERFORATION	ANTEROINFERIOR & POSTEROINFERIOR	11%	LEFT MILD CONDUCTIVE HEARING LOSS	CONDUCTIVE	35	MILD
6572986	19Y	F	RIGHT	CHILDHOOD	LARGE CENTRAL PERFORATION	ANTEROSUPERIOR, ANTEROINFERIOR. PSOTEROSUPERIOR AND POSTEROINFERIOR	44%	RIGHT MILD CONDUCTIVE HEARING LOSS	CONDUCTIVE	30	MILD
1035672	21Y	F	RIGHT	CHILDHOOD	LARGE CENTRAL PERFORATION	ANTEROSUPERIOR, ANTEROINFERIOR. PSOTEROSUPERIOR AND POSTEROINFERIOR	66%	RIGHT MODERATE CONDUCTIVE HEARING LOSS	CONDUCTIVE	50	MODERATE
1035672	21Y	F	LEFT	CHILDHOOD	LARGE CENTRAL PERFORATION	ANTEROSUPERIOR, ANTEROINFERIOR. PSOTEROSUPERIOR AND POSTEROINFERIOR	65%	LEFT MODERATE CONDUCTIVE HEARING LOSS	CONDUCTIVE	45	MODERATE
1066254	49Y	F	RIGHT	CHILDHOOD	MEDIUM CENTRAL PERFORATION	POSTEROSUPERIOR AND POSTEROINFERIOR	52%	RIGHT MILD MIXED HEARING LOSS	MIXED	35	MILD
1066254	49Y	F	LEFT	CHILDHOOD	SMALL CENTRAL PERFORATION	ANTEROINFERIOR	87%	LEFT MILD CONDUCTIVE HEARING LOSS	CONDUCTIVE	30	MILD
6335901	32Y	F	RIGHT	CHILDHOOD	MEDIUM CENTRAL PERFORATION	ANTEROSUPERIOR, ANTEROINFERIOR.	18%	RIGHT MODERATE CONDUCTIVE HEARIG LOSS	CONDUCTIVE	50	MODERATE
1198778	33Y	M	RIGHT	6Y	MEDIUM CENTRAL PERFORATION	ANTEROINFERIOR & POSTEROINFERIOR	37%	RIGHT MODERATE CONDUCTIVE HEARING LOSS	CONDUCTIVE	35	MODERATE
6577890	44Y	F	RIGHT	15Y	LARGE CENTRAL PERFORATION	ANTEROSUPERIOR,ANTEROINFERIOR,POSTEROSUPERIOR, POSTEROINFERIOR	43%	RIGHT MODERATE CONDUCTIVE HEARING LOSS	CONDUCTIVE	35	MODERATE
6225678	46Y	F	RIGHT	CHILDHOOD	LARGE CENTRAL PERFORATION.	ANTEROSUPERIOR,ANTEROINFERIOR,POSTEROSUPERIOR,POSTEROINFERIOR.	49%	RIGHT MODERATELY SEVERE MIXED HEARING LOSS.	MIXED	60	ODERATELY SEVER
6225678	46Y	F	LEFT	15Y	SMAL CENTRAL PERFORATION	ANTEROSUPERIOR	13%	LEFT MILD CONDUCTIVE HEARING LOSS.	CONDUCTIVE	30	MILD
1065572	33Y	F	RIGHT	CHILDHOOD	LARGE CENTRAL PERFORATION	ANTEROSUPERIOR,ANTEROINFERIOR,POSTEROSUPERIOR,POSTEROINFERIOR	40%	RIGHT MODERATE CONDUCTIVE HEARING LOSS	CONDUCTIVE	45	MODERATE

1065572	33Y	F	LEFT	CHILDHOOD	LARGE CENTRAL PERFORATION	ANTEROSUPERIOR,ANTEROINFERIOR,POSTEROSUPERIOR,POSTEROINFERIOR	51%	LEFT MODERATELY SEVERE MIXED HEARING LOSS	MIXED	60	IODERATELY SEVER
1345233	44Y	M	LEFT	3Y	SMALL CENTRAL PERFORATION	ANTEROSUPERIOR	10%	LEFT MILD CONDUCTIVE HEARING LOSS	CONDUCTIVE	21	MILD
1427736	26Y	F	LEFT	CHILDHOOD	MEDIUM CENTRAL PERFORATION	ANTEROSUPERIOR, ANTEROINFERIOR	32%	LEFT MILD CONDUCTIVE HEARING LOSS	CONDUCTIVE	31	MILD
1422633	24Y	F	LEFT	CHILDHOOD	MEDIUM CENTRAL PERFORATION	ANTEROSUPERIOR,ANTEROINFERIOR.	17%	LEFT MILD CONDUCTIVE HEARING LOSS	CONDUCTIVE	35	MILD
6775623	32Y	F	RIGHT	12Y	SMALL CENTRAL PERFORATION	ANTEROINFERIOR.	13%	RIGHT MILD CONDUCTIVE HEARING LOSS.	CONDUCTIVE	28	MILD
6775623	32Y	F	LEFT	12Y	SMALL CENTRAL PERFORATION	ANTEROSUPERIOR	6%	LEFT MILD CONDUCTIVE HEARING LOSS	CONDUCTIVE	28	MILD
1099834	28Y	F	LEFT	CHILDHOOD	MEDIUM CENTRAL PERFORATION	ANTEROINFERIOR & POSTEROINFERIOR	17%	LEFT SEVERE MIXED HEARING LOSS	MIXED	72	SEVERE
6886723	26Y	F	LEFT	CHILDHOOD	MEDIUM CENTRAL PERFORATION	POSTEROSUPERIOR & POSTEROINFERIOR	21%	LEFT MODERATE CONDUCTIVE HEARING LOSS	CONDUCTIVE	45	MODERATE
1772649	29Y	F	RIGHT	5Y	LARGE CENTRAL PERFORATION	ANTEROSUPERIOR,ANTEROINFERIOR,POSTEROSUPERIOR, POSTEROINFERIOR	17%	RIGHT MILD CONDUCTIVE HEARING LOSS	CONDUCTIVE	38	MILD
1187382	40Y	F	LEFT	1Y	SMALL CENTRAL PERFORATION	ANTEROINFERIOR	12%	LEFT MILD MIXED HEARING LOSS	MIXED	32	MILD
1993667	29Y	M	RIGHT	6 MONTHS	SMALL CENTRAL PERFORATION	ANTEROINFERIOR	18%	LEFT MILD CONDUCTIVE HEARING LOSS	CONDUCTIVE	24	MILD
6993672	48Y	F	RIGHT	2Y	SMALL CENTRAL PERFORATION	POSTEROINFERIOR	6%	RIGHT MILD CONDUCTIVE HEARING LOSS	CONDUCTIVE	30	MILD
6447224	45Y	F	RIGHT	15Y	LARGE CENTRAL PERFORATION	ANTEROSUPERIOR,ANTEROINFERIOR,POSTEROSUPERIOR, POSTEROINFERIOR	41%	RIGHT MODERATELY SEVERE MIXED HEARING LOSS.	MIXED	65	IODERATELY SEVERI
6447224	45Y	F	LEFT	15Y	LARGE CENTRAL PERFORATION	ANTEROSUPERIOR,ANTEROINFERIOR,POSTEROSUPERIOR, POSTEROINFERIOR	33%	LEFT MODERATE CONDUCTIVE HEARING LOSS	CONDUCTIVE	55	MODERATE
1137623	18Y	M	RIGHT	5Y	MEDIUM CENTRAL PERFORATION.	ANTEROINFERIOR,ANTEROSUPERIOR.	19%	RIGHT MILD CONDUCTIVE HEARING LOSS.	CONDUCTIVE	28	MILD.
1137623	18Y	M	LEFT	10Y	LARGE CENTRAL PERFORATION	ANTEROSUPERIOR,ANTEROINFERIOR,POSTEROSUPERIOR, POSTEROINFERIOR	33%	LEFT MILD CONDUCTIVE HEARING LOSS	CONDUCTIVE	30	MILD
6982263	32Y	F	LEFT	CHILDHOOD	LARGE CENTRAL PERFORATION	ANTEROSUPERIOR,ANTEROINFERIOR,POSTEROSUPERIOR, POSTEROINFERIOR	36%	LEFT MILD CONDUCTIVE HEARING LOSS	CONDUCTIVE	36	MILD
6338236	39Y	F	LEFT	4Y	MEDIUM CENTRAL PERFORATION	ANTEROSUPERIOR, ANTEROINFERIOR	21%	LEFT MODERATELY SEVERE CONDUCTIVE HEARING LOSS	CONDUCTIVE	63	IODERATELY SEVER
1445734	21Y	F	LEFT	10Y	LARGE CENTRAL PERFORATION	ANTEROSUPERIOR,ANTEROINFERIOR,POSTEROSUPERIOR, POSTEROINFERIOR	46%	LEFT MILD CONDUCTIVE HEARING LOSS	CONDUCTIVE	38	MILD
1223758	22Y	F	LEFT	CHILDHOOD	MEDIUM CENTRAL PERFORATION	ANTEROINFERIOR & POSTEROINFERIOR	25%	LEFT SEVERE MIXED HEARING LOSS	MIXED	75	SEVERE
1184648	40Y	F	LEFT	8Y	MEDIUM CENTRAL PERFORATION	ANTEROSUPERIOR & ANTEROINFERIOR	20%	LEFT MODERATE CONDUCTIVE HEARING LOSS	CONDUCTIVE	45	MODERATE
1134947	19Y	F	RIGHT	3Y	SMALL CENTRAL PERFORATION	POSTEROINFERIOR	20%	RIGHT MILD CONDUCTIVE HEARING LOSS	CONDUCTIVE	30	MILD
1226483	30Y	F	LEFT	3Y	SMALL CENTRAL PERFORATION	POSTEROINFERIOR	4%	LEFT MILD CONDUCTIVE HEARING LOSS	CONDUCTIVE	30	MILD
6774292	54Y	M	RIGHT	2Y	LARGE CENTRAL PERFORATION	ANTEROSUPERIOR,ANTEROINFERIOR,POSTEROSUPERIOR,POSTEROINFERIOR	25%	RIGHT MODERATE MIXED HEARING LOSS	MIXED	50	MODERATE MIXED
6774292	54Y	M	LEFT	2Y	LARGE CENTRAL PERFORATION	ANTEROSUPERIOR,ANTEROINFERIOR,POSTEROSUPERIOR,POSTEROINFERIOR	40%	LEFT MODERATELY SEVERE MIXED HEARING LOSS	MIXED	60	IODERATELY SEVER
1187337	46Y	F	LEFT	6MONTHS	MEDIUM CENTRAL PERFORATION	ANTEROSUPERIOR & ANTEROINFERIOR	20%	LEFT MODERATELY SEVERE MIXED HEARING LOSS	MIXED	60	IODERATELY SEVER
1183667	28Y	F	RIGHT	4Y	MEDIUM CENTRAL PERFORATION	ANTEROSUPERIOR & ANTEROINFERIOR	21%	RIGHT MILD CONDUCTIVE HEARING LOSS	CONDUCTIVE	40	MILD
688367	26Y	M	RIGHT	2Y	MEDIUM CENTRAL PERFORATION	ANTEROSUPERIOR & ANTEROINFERIOR	20%	RIGHT MILD CONDUCTIVE HEARING LOSS	CONDUCTIVE	32	MILD
1126598	41Y	F	LEFT	CHILDHOOD	LARGE CENTRAL PERFORATION	ANTEROSUPERIOR,ANTEROINFERIOR,POSTEROSUPERIOR, POSTEROINFERIOR	40%	LEFT MODERATE CONDUCTIVE HEARING LOSS	CONDUCTIVE	50	MODERATE
1263097	39Y	F	RIGHT	3Y	MEDIUM CENTRAL PERFORATION	ANTEROSUPERIOR & ANTEROINFERIOR	17%	RIGHT MILD CONDUCTIVE HEARING LOSS	CONDUCTIVE	25	MILD
1173887	35Y	M	LEFT	CHILDHOOD	LARGE CENTRAL PERFORATION	ANTEROSUPERIOR,ANTEROINFERIOR,POSTEROSUPERIOR, POSTEROINFERIOR	40%	LEFT MODERATELY SEVERE CONDUCTIVE HEARING LOSS	CONDUCTIVE	65	IODERATELY SEVER
6022588	59Y	F	LEFT	8Y	MEDIUM CENTRAL PERFORATION	ANTEROSUPERIOR & ANTEROINFERIOR	22%	LEFT MODERATELY CONDUCTIVE HEARING LOSS	CONDUCTIVE	40	MODERATE
1033762	52Y	M	RIGHT	CHILDHOOD	LARGE CENTRAL PERFORATION	ANTEROSUPERIOR,ANTEROINFERIOR,POSTEROSUPERIOR,POSTEROINFERIOR	35%	RIGHT MILD CONDUCTIVE HEARING LOSS	CONDUCTIVE	35	MILD
1033762	52Y	M	LEFT	CHILDHOOD	LARGE CENTRAL PERFORATION	ANTEROSUPERIOR,ANTEROINFERIOR,POSTEROSUPERIOR,POSTEROINFERIOR	36%	LEFT MODERATE CONDUCTIVE HEARING LOSS	CONDUCTIVE	45	MODERATE
6689390	43Y	F	RIGHT	3Y	MEDIUM CENTRAL PERFORATION	ANTEROSUPERIOR & POSTEROSUPERIOR	27%	RIGHT MODERATELY SEVERE CONDUCTIVE HEARING LOSS	CONDUCTIVE	65	IODERATELY SEVER
1165289	32Y	F	LEFT	5Y	LARGE CENTRAL PERFORATION	ANTEROSUPERIOR,ANTEROINFERIOR,POSTEROSUPERIOR, POSTEROINFERIOR	37%	LEFT MODERATE MIXED HEARING LOSS	MIXED	50	MODERATE
1179278	34Y	F	RIGHT	5Y	LARGE CENTRAL PERFORATION	ANTEROSUPERIOR,ANTEROINFERIOR,POSTEROSUPERIOR,POSTEROINFERIOR	55%	RIGHT SEVERE CONDUCTIVE HEARING LOSS	CONDUCTIVE	65	SEVERE
1179278	34Y	F	LEFT	3Y	LARGE CENTRAL PERFORATION	ANTEROSUPERIOR,ANTEROINFERIOR,POSTEROSUPERIOR,POSTEROINFERIOR	51%	LEFT MODERATE CONDUCTIVE HEARING LOSS	CONDUCTIVE	45	MODERATE
1187289	54Y	F	LEFT	8Y	LARGE CENTRAL PERFORATION	ANTEROSUPERIOR,ANTEROINFERIOR,POSTEROSUPERIOR, POSTEROINFERIOR	38%	LEFT MILD CONDUCTIVE HEARING LOSS	CONDUCTIVE	33	MILD
1176229	22Y	F	RIGHT	7Y	LARGE CENTRAL PERFORATION	ANTEROSUPERIOR,ANTEROINFERIOR,POSTEROSUPERIOR, POSTEROINFERIOR	29%	RIGHT SEVERE CONDUCTIVE HEARING LOSS	CONDUCTIVE	60	SEVERE
1176229	22Y	F	LEFT	3Y	MEDIUM CENTRAL PERFORATION	ANTEROSUPERIOR,ANTEROINFERIOR,POSTEROSUPERIOR.	21%	LEFT MODERATE CONDUCTIVE HEARING LOSS	CONDUCTIVE	45	MODERATE

6722876	27Y	M	LEFT	CHILDHOOD	MEDIUM CENTRAL PERFORATION	ANTEROINFERIOR & POSTEROINFERIOR	48%	LEFT MODERATELY SEVERE CONDUCTIVE HEARING LOSS	CONDUCTIVE	65	IODERATELY SEVER
1167289	19Y	M	RIGHT	2Y	SMALL CENTRAL PERFORATION	ANTEROINFERIOR	9%	RIGHT MILD CONDUCTIVE HEARING LOSS	CONDUCTIVE	30	MILD
6335892	24Y	F	RIGHT	5Y	LARGE CENTRAL PERFORATION	ANTEROSUPERIOR,ANTEROINFERIOR,POSTEROSUPERIOR, POSTEROINFERIOR	62%	RIGHT SEVERE MIXED HEARING LOSS	MIXED	70	SEVERE
6335892	24Y	F	LEFT	CHILDHOOD	LARGE CENTRAL PERFORATION	ANTEROSUPERIOR,ANTEROINFERIOR,POSTEROSUPERIOR, POSTEROINFERIOR	60%	LEFT MLD MIXED HEARING LOSS	MIXED	40	MILD
1087765	48Y	F	LEFT	20Y	LARGE CENTRAL PERFORATION	ANTEROSUPERIOR,ANTEROINFERIOR,POSTEROSUPERIOR, POSTEROINFERIOR	55%	LEFT MILD MIXED HEARING LOSS	MIXED	40	MILD
1173556	23Y	M	LEFT	CHILDHOOD	LARGE CENTRAL PERFORATION	ANTEROSUPERIOR,ANTEROINFERIOR,POSTEROSUPERIOR, POSTEROINFERIOR	26%	LEFT MILD CONDUCTIVE HEARING LOSS	CONDUCTIVE	28	MILD
1198337	30Y	F	LEFT	3Y	LARGE CENTRAL PERFORATION	ANTEROSUPERIOR,ANTEROINFERIOR,POSTEROSUPERIOR, POSTEROINFERIOR	44%	LEFT SEVERE CONDUCTIVE HEARING LOSS	CONDUCTIVE	65	SEVERE
1033762	46Y	F	LEFT	CHILDHOOD	MEDIUM CENTRAL PERFORATION	ANTEROSUPERIOR,ANTEROINFERIOR.	22%	LEFT MILD CONDUCTIVE HEARING LOSS	CONDUCTIVE	25	MILD
1936893	58Y	F	RIGHT	12Y	LARGE CENTRAL PERFORATION	ANTEROSUPERIOR,ANTEROINFERIOR,POSTEROSUPERIOR, POSTEROINFERIOR	22%	RIGHT MODERATE CONDUCTIVE HEARING LOSS	CONDUCTIVE	45	MODERATE
6628738	58Y	M	RIGHT	10Y	MEDIUM CENTRAL PERFORATION	ANTEROSUPERIOR,ANTEROINFERIOR	20%	RIGHT MODERATE CONDUCTIVE HEARING LOSS	CONDUCTIVE	40	MODERATE
6837930	53Y	F	RIGHT	15Y	LARGE CENTRAL PERFORATION	ANTEROSUPERIOR,ANTEROINFERIOR,POSTEROSUPERIOR, POSTEROINFERIOR	41%	RIGHT SEVERE MIXED HEARING LOSS	MIXED	72	SEVERE
1028647	23Y	M	LEFT	3Y	SMALL CENTRAL PERFORATION	ANTEROSUPERIOR	20%	LEFT MILD CONDUCTIVE HEARING LOSS	CONDUCTIVE	35	MILD
6036829	23Y	M	LEFT	CHILDHOOD	MEDIUM CENTRAL PERFORATION	ANTEROSUPERIOR,ANTEROINFERIOR	16%	LEFT MILD CONDUCTIVE HEARING LOSS	CONDUCTIVE	28	MILD
1093689	27Y	F	LEFT	1Y	SMALL CENTRAL PERFORATION	ANTEROSUPERIOR.	52%	LEFT MODERATE CONDUCTIVE HEARING LOSS	CONDUCTIVE	50	MODERATE
6683089	23Y	F	LEFT	7Y	LARGE CENTRAL PERFORATION	ANTEROSUPERIOR,ANTEROINFERIOR,POSTEROSUPERIOR, POSTEROINFERIOR	64%	LEFT MODERATE MIXED HEARING LOSS	MIXED	55	MODERATE
1033672	40Y	F	RIGHT	CHILDHOOD	LARGE CENTRAL PERFORATION	ANTEROSUPERIOR,ANTEROINFERIOR,POSTEROSUPERIOR,POSTEROINFERIOR	41%	RIGHT SEVERE MIXED HEARING LOSS.	MIXED	68	SEVERE
1033672	40Y	F	LEFT	CHILDHOOD	LARGE CENTRAL PERFORATION	ANTEROSUPERIOR,ANTEROINFERIOR,POSTEROSUPERIOR,POSTEROINFERIOR	33%	LEFT MLD CONDUCTIVE HEARING LOSS	CONDUCTIVE	33	MILD
6037827	22Y	M	LEFT	3Y	SMALL CENTRAL PERFORATION	POSTEROINFERIOR	16%	LEFT MILD CONDUCTIVE HEARING LOSS	CONDUCTIVE	30	MILD
6693568	23Y	F	RIGHT	7Y	MEDIUM CENTRAL PERFORATION	ANTEROSUPERIOR,ANTEROINFERIOR.	20%	RIGHT MODERATE CONDUCTIVE HEARING LOSS	CONDUCTIVE	45	MODERATE
6730738	19Y	F	LEFT	4Y	SMALL CENTRAL PERFORATION	ANTEROINFERIOR	8%	LEFT MILD CONDUCTIVE HEARING LOSS	CONDUCTIVE	25	MILD
1088363	42Y	M	RIGHT	12Y	LARGE CENTRAL PERFORATION	ANTEROSUPERIOR,ANTEROINFERIOR,POSTEROSUPERIOR, POSTEROINFERIOR	38%	RIGHT MODERATE MIXED HEARING LOSS	CONDUCTIVE	50	MODERATE
1345297	22Y	M	LEFT	3Y	MEDIUM CENTRAL PERFORATION	ANTEROSUPERIOR,ANTEROINFERIOR.	17%	LEFT MODERATE CONDUCTIVE HEARING LOSS	CONDUCTIVE	40	MODERATE
1198368	56Y	F	LEFT	15Y	LARGE CENTRAL PERFORATION	ANTEROSUPERIOR,ANTEROINFERIOR,POSTEROSUPERIOR, POSTEROINFERIOR	44%	LEFT MODERATELY SEVERE MIXED HEARING LOSS	MIXED	68	IODERATELY SEVER
1359751	33Y	M	RIGHT	38Y	LARGE CENTRAL PERFORATION	ANTEROSUPERIOR,ANTEROINFERIOR,POSTEROSUPERIOR, POSTEROINFERIOR	30%	RIGHT MODERATE CONDUCTIVE HEARING LOSS.	CONDUCTIVE	45	MODERATE
1359751	33Y	M	LEFT	38Y	LARGE CENTRAL PERFORATION	ANTEROSUPERIOR,ANTEROINFERIOR,POSTEROSUPERIOR, POSTEROINFERIOR	61%	LEFT MODERATE MIXED HEARING LOSS	MIXED	50	MODERATE
1183689	33Y	F	RIGHT	2Y	SMALL CENTRAL PERFORATION	ANTEROINFERIOR	15%	RIGHT MILD CONDUCTIVE HEARING LOSS	CONDUCTIVE	25	MILD
1663869	45Y	F	RIGHT	30Y	LARGE CENTRAL PERFORATION	ANTEROSUPERIOR,ANTEROINFERIOR,POSTEROSUPERIOR, POSTEROINFERIOR	35%	RIGHT SEVERE CONDUCTIVE HEARING LOSS	CONDUCTIVE	65	SEVERE
6956372	20Y	M	RIGHT	8Y	LARGE CENTRAL PERFORATION	ANTEROSUPERIOR,ANTEROINFERIOR,POSTEROSUPERIOR, POSTEROINFERIOR	41%	RIGHT MODERATE CONDUCTIVE HEARING LOSS	CONDUCTIVE	50	MODERATE
1267889	19Y	M	RIGHT	5Y	LARGE CENTRAL PERFORATION	ANTEROSUPERIOR,ANTEROINFERIOR,POSTEROSUPERIOR, POSTEROINFERIOR	54%	RIGHT MILD MIXED HEARING LOSS,	MIXED	30	MILD
1267889	19Y	M	LEFT	8Y	LARGE CENTRAL PERFORATION	ANTEROSUPERIOR,ANTEROINFERIOR,POSTEROSUPERIOR, POSTEROINFERIOR	47%	LEFT MODERATE CONDUCTIVE HEARING LOSS	CONDUCTIVE	45	MODERATE
6384790	48Y	F	LEFT	20Y	LARGE CENTRAL PERFORATION	ANTEROSUPERIOR, ANTEROINFERIOOR, POSTEROSUPERIOR, POSTEROINFERIOR	64%	LEFT MODERATE MIXED HEARING LOSS	MIXED	45	MODERATE
1187356	45Y	M	RIGHT	CHILDHOOD	LARGE CENTRAL PERFORATION	ANTEROSUPERIOR, ANTEROINFERIOOR, POSTEROSUPERIOR, POSTEROINFERIOR	64%	RIGHT MODERATE MIXED HEARING LOSS	MIXED	60	MODERATE
1187356	45Y	M	LEFT	5Y	MEDIUM CENTRAL PERFORATION	ANTEROSUPERIOR, ANTEROINFERIOOR.	23%	LEFT MILD CONDUCTIVE HEARING LOSS	CONDUCTIVE	40	MILD
1266736	41Y	F	RIGHT	CHILDHOOD	LARGE CENTRAL PERFORATION	ANTEROSUPERIOR, ANTEROINFERIOOR, POSTEROSUPERIOR, POSTEROINFERIOR	65%	RIGHT MILD MIXED HEARING LOSS	MIXED	40	MILD
1266736	41Y	F	LEFT	CHILDHOOD	LARGE CENTRAL PERFORATION	ANTEROSUPERIOR, ANTEROINFERIOOR, POSTEROSUPERIOR, POSTEROINFERIOR	60%	LEFT MILD MIXED HEARING LOSS	MIXED	40	MILD
6836782	42Y	M	RIGHT	2Y	SMALL CENTRAL PERFORATION	ANTEROINFERIOR	13%	RIGHT MILD CONDUCTIVE HEARING LOSS	CONDUCTIVE	30	MILD