A COMPARATIVE STUDY BETWEEN

ENDOSCOPIC ASSISTED AND MICROSCOPIC

ASSISTED MYRINGOPLASTY

DISSERTATION SUBMITTED FOR

MASTER OF SURGERY BRANCH IV

(OTO – RHINO – LARYNGOLOGY)

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DR.M.G.R. MEDICAL UNIVERSITY

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April 2015

CERTIFICATE FROM HOD

This is to certify that the dissertation entitled **"A Comparative study between endoscopic assisted and microscopic assisted myringoplasty**" is the bonafide work of **DR.VIJAYABHARATHI.D**, in partial fulfilment of university regulation of the Tamil Nadu Dr. M.G.R. Medical University, Chennai, **MASTER OF SURGERY BRANCH IV (OTORHINOLARYNGOLOGY**) examination to be held in **April 2015.**

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CONTENTS

ABSTRACT

INTRODUCTION:

Myringoplasty is repair of the perforation of tympanic membrane when middle ear space, its mucosa and ossicle are free of disease. Myringoplasty is commonly done under microscopy; Major disadvantage of operating microscope is that it provides a magnified image along a straight line. Now a day's Endoscope is widely used to perform various surgeries and very useful while operating in cavities. Therefore in the present study we correlate the outcome of myringoplasty by microscopic method and endoscopic method.

AIM AND OBJECTIVES:

To compare the percentage of graft uptake and improvement in A-B gap between microscopic and endoscopic group

MATERIALS AND METHODOLOGY:

The present study was conducted in department of otolaryngology in Madurai medical college. A total of 40 patients were selected having central perforation of tympanic membrane. These 40 patients were divided into two equal groups of 20 patients each. All the patients underwent myringoplasty under local anesthesia. In the first group, endoscope was used and in the second group microscope was used to do myringoplasty.

The graft uptakewas assessed and postoperative pure tone audiograms were compared with preoperative pure tone audiogram

RESULTS:

At end of 6 month post op period endoscopic group, out of 20cases, 85% graft uptake. Microscopic group 80% graft uptake. Student's t- test(P value 0.915) shows there is no significant difference in graft uptake in both group. Hearing improvements are similar in both groups. Student's t-test was used for statistical analysis for comparing the results (gain in A-B gap) of two groups, P value was 0.514. Hence there is no significant difference in the gain in A-B gap between the two groups.

CONCLUSION:

The present study, graft uptake rate in endoscopic and microscopic myringoplasty are similar ,but in terms of minimal invasive surgery, proximity vision provided , wide angle view, visualize of the deep recess and hidden areas of middle ear in single operating field, postoperative recovery , less operative time, Endoscopic method produced superior results and overcomes the disadvantage of microscope.

KEY WORDS:

MYRINGOPLASTY, Endoscope, Microscope, A-B gap, Graft uptake.

INTRODUCTION:

Chronic suppurative otitis media (CSOM) is wide spread disease of the developing countries. Hence treating CSOM with surgical treatment by Tympanoplasty is one the common procedure in ENT

Myringoplasty and Tympanoplasty are defined as surgical procedure that is used for repair of tympanic membrane and middle ear. Myringoplasty is repair of the perforation of tympanic membrane when middle ear space, its mucosa and ossicle are free of disease. Tympanoplasty implies not only reconstruction of TM , But also eradication of disease in middle ear cleft such as chronic infection, cholesteatoma, ossicular chain problem etc.

Initially full and split thickness skin graft are used, followed by canal wall skin, vein, perichondrium, and temporalis fascia graft are used. Temporalis fascia remains most commonly used material now.

Common problem encountered in reconstruction of the tympanic membrane are poor exposure to vital area of tympanic cavity like sinus tympani, difficulty in removing all squamous epithelium in the area to be covered by graft ,epithelial pearl formation , development of disease sequlae like tympanosclerosis ,appearance of cicatrial tissue ,blunting of anterior canal recess, post op migration of graft from malleus handle , retraction of graft, graft rejection .various new technique tried to overcome this problems.

The goal of any procedure is to produce a new tympanic membrane that will function as closely to orginal.

Introduction of operating microscope significantly enhanced surgical result by improving the accuracy of the technique. But operating microscope provides magnified image in straight line extending from the objective lens, hence surgeon can't visualize the deep recess of middle ear in single operating field. Using microscope, initially permeatal overlay technique done, gradually changed to post aural or end aural underlay technique because of disadvantage of permeatal approach through microscope. This is overcome by use of rigid endoscope.

The use of rigid endoscope in the management of dry central perforation of tympanic membrane represented a significant advance in middle ear surgery. It replaces operating microscope in examination and surgery of the tympanic membrane perforation.

The proximity vision provided, possibility of an all round vision just by rotating the angled scope, thus ,deep anterior canal wall ,anterior recess, anterior marginal perforation, sinus tympani , facial recess , hypotympanum and attic are visualized by rotating the angled scope. Minimal invasive surgery is advantage of the endoscope.

Therefore in the present study we correlate the outcome of myringoplasty by microscopic method and endoscopic method.

Aim of the study

To compare the percentage of graft uptake and improvement in A-B gap (Hearing status) when dry central perforation in CSOM is treated with microscopic and endoscopic myringoplasty.

REVIEW OF LITERATURE

ENDOSCOPIC ASSISTED MYRINGOPLASTY

Balasubramanian thiagarajan, stanely medical college,

otolaryngology online journal.

Myringoplasty is commonly done under microscope .In this study using endoscopic guidance myringoplasty done in 50 cases. After 4th week of postoperative period, out of 50 cases, 42 cases had intact membrane. preoperative audiogram shows 32 patient had 30-35 db hearing loss ,18 patient had 35-40 db hearing loss. All the patient after endoscopic myringoplasty had a pure tone hearing average of 20 db .success rate of endoscopic myringoplasty compared with various studies performed using microscopic procedure. Result of endoscopic procedure more similar to microscopic myringoplasty. Endoscopic myringoplasty is worthwhile due to obvious advantage.

A COMPARITIVE STUDY OF ENDOSCOPIC ASSISTED AND MICROSCOPIC ASSISTED MYRINGOPLASTY

A.S Harugop, R.S Mudhol *Indian Journal of Otorhinolaryngology*

A comparative study of endoscopy assisted myringoplasty and microscopy method of myringoplasty done between 2003 to 2006.100 patient underwent myringoplasty, 50 underwent endoscopic procedure

and 50 underwent microscopic procedure. Surgery result compared at end of 6 month post operatively. Endoscopic group 82% success outcome and in microscopic group 86% had successful outcome. Surgical outcome of endoscopy assisted myringoplasty was comparable to the conventional microscopic assisted myringoplasty but in terms of cosmesis, post-operative recovery, the patient in endoscope group had better result. concluded that surgery with endoscope has several advantages and few disadvantages.

ENDOSCOPIC ASSISTED MYRINGOPLASTY

Yadav sps, Aggarwal N. Julaha m, Goel A *Singapore medical Journal of Otorhinolaryngology*

Endoscopic assisted myringoplasty was carried out in 50 patients aged 18-45 yr, using temporalis fascia graft. Over all graft uptake and improvement in conductive deafness as air bone gap closure was achieved in 80% of cases, they concluded that endoscopic myringoplasty is equally effective, less morbid, very cost effective in small central perforation, however it is not effective in large perforation.

ENDOSCOPIC TRANSCANAL MYRINGOPLASTY

Anoop raj , Ravi meher *Indian Journal of Otorhinolaryngology*

A study conducted by Raj A, Mehar R on endoscopic transcanal myringoplasty and compares the outcomes with that of myringoplasty using microscope, showed that graft uptake is 90% in endoscopic method and 85% in microscopic method but there was no significant differences between the gains in the air bone gap in either group. Study was done on 40 patients. These 40 patients were divided into 2 equal groups of 20 patients each.

Tympanoscope assisted myringoplasty

Karchuketo TS

He studied 30 ears of 29 patients with different sized perforation underwent endoscope assisted myringoplasty. In their study concluded that the post operative air bone gap < 10 dB in 90% cases. Hence tympanoscope assisted myringoplasty is reliable and simple procedure with the benefit of minimal trauma to the healthy tissue.

Endoscopic transtympanic tympanoplasty

Kakachata, seizi et al

Study concluded that as opposed to conventional methods, the endoscopic method does not need a surgical procedure like as otosclerotic drilling for wide exposure and it avoids the unnecessary substantial risk of injury to chorda tympani. For disrupted ossicular

chain reconstruction Endoscopic transtympanic tympanoplasty is an adequate and minimal tissue invasive procedure and should prove to be an useful surgical procedure in future endoscopic Tympanoplasty.

Endoscopy in otology –In retrospect and prospects

Bhattarai H Nepalese journal of Ent HEAD and neck surgery

Role of endoscope in otology a diagnostic, a surgical and a teaching tool is increasing being recognized because of its superior optical properties and its capacity to visualize hidden area with minimal invasion of tissue as compared to microscope. Myringoplasty with temporalis fascia can be done with endoscope with similar result to that of a microscopic procedure. Endoscopic myringoplasty is minimally invasive, effective and reliable procedure in management of tympanic perforation.

Endoscopic transcanal middle ear surgery

Muaaz Tarabichi

Studied the Endoscopic transcanal middle ear surgery and concluded that the wide angle view provided by the endoscopes enables trans-canal access to the tympanic cavity, attic, sinus tympani, facial recess and hypotympanum. these areas are the primary sites of the disease and surgical failure to cure.

Trascanal endoscopic management of cholesteatoma

Tarabichi Muaaz

Studied the Trascanal endoscopic management of cholesteatoma and concluded that Endoscopic management of cholesteatoma allows the use of the ear canal as the direct and natural access point to cholesteatoma within the mesotympanum, attic, facial recess, sinus tympani, hypotympanum, and Eustachian tube. It does not improve access to mastoid disease.

ANATOMY OF MIDDLE EAR CAVITY PROPER AND TYMPANIC MEMBRANE

MIDDLE EAR CAVITY PROPER

The middle ear cavity present between the external and internal ear. It shape like biconcave disc, the measurement of vertical diameters are 15 mm, the transverse diameter are measured as 6 mm at the upper portion, 2mm at the centre portion and 4 mm at the lower portion.

It is formed by 6 walls .The tympanic membrane forms the lateral wall of the middle ear, it divide the middle ear in to three parts.

1. Mesotympanum
2. Epitympanum
3. Hypotympanum

Mesotympanum

Draw a line at horizontal plane at the top and bottom edge of pars tensa of tympanic membrane, portion of middle ear present behind the pars tensa of the tympanic membrane

Epitympanum

Portion of middle ear present above the anterior and posterior malleolar folds of the Sharpnell's membrane or above the short process of

malleus. Content present in this space are malleus head, body of the incus, associated ligaments and mucous fold.

Hypotympanum

Portion of middle ear present, below the floor of bony canal wall or below the tympanic membrane

Lateral wall

Sharpnell's membrane forms the major portion of the lateral wall and partly wedge shaped bony wall called scutum.

Medial wall

Middle ear was separated from the inner ear by medial wall, it presents,

1. Promontory :is a rounded bulging prominent part produced by the first turn of the cochlea
2. Fenestra vestibuli is an oval opening present posterosuperior to promontory leads to scala vestibule of inner ear. Footplate of stapes closed the opening.
3. Fenestra cochleae is a round opening present posteroinferior to the promontory leads to scala tympani of inner ear. Secondary tympanic membrane closed the round window opening.

4. Tympanic portion of Facial nerve runs in inferior direction below the lateral semicircular canal.
5. Sinus tympani present as a depression behind the promontory, bounded superiorly ponticulus and inferiorly subiculum.

Anterior wall Openings

Three structures opened into the anterior wall

a. Superiorly opening of Canal for tensor tympani muscle
b. In the middle , opening of auditory tube
c. Inferiorly , posterior wall of carotid canal formed by thin plate of bone this bone , separate the carotid canal from the middle ear, this plate is perforated by caroticotympanic nerve and branch of internal carotid artery

Posterior wall

The following structure present from above downwards in posterior wall superiorly: There is aditus, it connect to antrum through epitympanic recess communicate with mastoid antrum. Short process of incus present on its floor with facial nerve, while lateral semicircular canal lies in its medial wall.

Fossa incudis a depression seen in the posterior wall that lodges the Short process of incus

A conical like projection called pyramid, with an opening as its apex for the passage of tendon of stapedial muscle, this muscle insert into neck of stapes at its posterior surface. The extracranial portion of the 7th nerve (vertical part of mastoid segment of facial nerve) passes downwards in the posterior wall, exit through the stylomastoid foramen.

Two recesses present in the posterior wall are, Facial recess and sinus tympani. Direct visualization of the two recesses are difficult. But visualize with help of angled scope. Residivism and recurrence of cholesteatoma are most common in these recesses after the cholesteatoma ear surgery. Boundaries of facial recess or suprapyramidal are medially by facial nerve, superiorly by fossa incudis and lateral boundary formed by the chorda tympani nerve .For procedure like posterior tympanotomy, accessed directly via this facial recess.

Floor

Thin bony plate forming the floor, it separated the tympanic cavity from the internal jugular bulb present in the jugular fossa. Sometime the jugular bulb come into the tympanic cavity, if any dehiscence of bone in this region.

Roof

It is formed by tegmen tympani, which is a part of petrous part of temporal bone. It separated the middle cranial Fossa from the tympanic cavity.

VENTILATORY ANATOMY

The air flows from the Eustachian tube from the nasopharynx to anterior mesotympanum. From here, it diverts up to the anterior epitympanum through the tympanic isthumus and flow backward to posterior epitympanum. Port of the air from the posterior epitympanum flows through the aditus to the mastoid antrum and mastoid air cells and part of it flows down via to the posterior mesotympanum. From the posterior mesotympanum, air flows to the hypotympanum as well. Any pathological dysfunction in the anatomy of ventilator pathway leads to inflammatory diseases of the tympanic cavity.

CONTENTS OF THE MIDDLE EAR

Ossicles

Three small bones in the middle ear conduct the sound from the ear drum to the oval window.

Malleus (hammer) is the largest ossicle, measuring 8 mm in length. Parts of malleus are head, neck, handle and anterior and lateral processes. The head is situated in the epitympanum. A lateral (short) process project laterally from the neck, the handle is firmly fixed to the pars tensa of the tympanic membrane

Incus (anvil) has a body, short process and long process. The body articulates with the head of malleus in the attic region and the short process project into the attic. The long process projects downwards behind the handle of malleus, it articulates with the head of the stapes via the lenticular process.

Stapes (stirrup) is the smallest ossicle measuring 3.5 mm in size .It consists of head, neck, footplate and anterior and posterior crura. The footplate of stapes is attached to the oval window by the annular ligament. Muscles

The tensor tympani and stapedius muscles decrease the movement of the ossicles.

The tensor tympani is inserted to the neck of malleus. First arch muscle supplied by branch of mandibular nerve (V3).

The stapedius is inserted to the neck of the stapes. Second arch muscle supplied by branch of facial nerve, i.e. nerve to stapedius

Mucosal folds and ligaments - keep the ossicles in place

Nerves

Chorda tympani is a branch of the facial nerve which carries the sense of taste. It enters the middle ear cavity from the posterior wall, runs forwards and lateral to the incus and medial to the malleus, escaping out through the anterior wall.

The tympanic plexus lies on the promontory. It is formed by tympanic branch of glossopharyngeal nerve and sympathetic fibers from the plexus around the internal carotid artery. It also carries the secretomotor to the parotid gland. Tympanic plexus innervates the medial surface of tympanic membrane, tympanic cavity, mastoid air cells and bony Eustachian tube. Tympanic branch of glossopharyngeal nerve can be sectioned in middle ear for treating the Frey's syndrome.

Vessels

Plexus of vessels of stylomastoid artery and from caroticotympanic artery

RELATIONS OF THE MIDDLE EAR CAVITY PROPER

External ear lies lateral to the ear drum.

Temporal lobe of the brain and meninges are above the antrum, aditus and epitympanum. The tegmen plate separates the middle ear cleft from the structures in the middle cranial fossa.

Cerebellum is posteromedial to the mastoid air cells.

Inner ear is medial to the antrum, aditus and tympanum

Horizontal semi circular canal is an important landmark which lies posterosuperior to the facial nerve.

Fifth and sixth cranial nerves lie close to the apex of the petrous pyramid.

Facial nerve – the horizontal part runs downwards in the medial wall of the tympanum. The vertical part runs downward behind the tympanum and in front of the mastoid cells and emerges out through the stylomastoid foramen.

Lateral sinus is posterior to the mastoid cells

Jugular bulb is in close contact with the floor of the tympanum.

Internal carotid artery is anterior to the tympanum.

BLOOD SUPPLY

The blood supply of the middle ear is from branches of :

Middle meningeal artery

Maxillary artery

Ascending pharyngeal artery

Stylomastoid branch of the posterior auricular artery

NERVE SUPPLY

Sensory: Tympanic branch of the ninth cranial nerve (jacobson's nerve) supplies through the tympanic plexus

Motor: Tensor tympani muscle is supplied by the mandibular division of the trigeminal nerve and the stapedius muscle is supplied by the facial nerve.

LYMPHATIC DRAINAGE

The lymphatics drain to the preauricular and the retro pharyngeal lymph nodes.

Tympanic membrane

FIG 1: NORMAL TYMPANIC MEMBRANE

Tympanic membrane is located at the medial end of the external acoustic meatus.It separate the tympanic cavity from external auditory canal .Lying obliquely forming an angle of 55 degree with floor of meatus. It measures approximately 9-10mm in vertical diameter and 8-9 mm in horizontal diameter. Oval in shape .peripheral part of the tympanic membrane is thicker and rounded, forms a fibrocartilagenous ring known as annulus or annular ligament, attached at its circumference to the tympanic sulcus at the medial end of meatus. The annulus and sulcus are deficient superiorly known as notch of rivinus. Anterior and posterior malleolar fold arising from notch of rivinus extend to the lateral surface

of malleus. The small, triangular area of membrane above these folds is lax and thin named as pars flaccida. The rest of membrane is pars tensa with rich middle fibrous layer.

Tympanic membrane formed from mergence of ectodermal meatal plugs of 1st brachial cleft with endodermal derivative of 1st branchial pouch. It composed of 3 layers. outer cuticular layer or ectodermal layer (keratinized stratified squamous epithelium) ,middle fibrous layer ,inner endodermal mucosal layer continuous with middle ear mucosa .stratified squamous epithelium of outer layer is again four layer ,stratum basale ,stratum spinosum ,stratum granulosum, stratum corneum.

Stratum basale is the dividing layer and replaced the superficial cell are periodically desquamated .epidermis of the tympanic membrane migrate from umbo outwards mostly towards the posterior superior region. Migration rate is 131 µm/day.

Middle layer has different characteristic in pars tensa and pars flaccida. In pars tensa has outer radial and inner circular fibres. This fibrous layer is responsible for normal tension of tympanic membrane. It is mainly (type 2 and type 3) collagenous fibres. In pars flaccida, this fibrous layer is absent.

Blood supply

Lateral surface of the tympanic membrane supplied through deep auricular branch of internal maxillary artery .medial surface of membrane is supplied through anterior tympanic branch from internal maxillary artery and posterior tympanic branch from stylomastoid artery, inferior tympanic branch from ascending pharyngeal artery. Outer surface drain into external jugular vein, inner surface is drained by venous plexus situated around Eustachian tube.

Innervations:

Anterior half of lateral surface by auriculotemporal nerve and posterior half by tympanic branch of vagus nerve(Arnold nerve) .Inner surface of membrane is supplied by tympanic plexus formed by jacobson's nerve(branch of glossopharyngeal nerve).

MIDDLE EAR CLEFT

It consists of

1. Tympanic cavity

2. Mastoid antrum

3. Aditus ad antrum

4. Eustachian tube

5. Mastoid air cells

The lining epithelium in the middle ear was pseudo stratified ciliated columnar and becomes pavement epithelium near attic and antrum. It is an extension from the nasopharynx .The mucous membrane in middle ear form mucous fold and divides the cavity into various compartments.

MASTOID

The mastoid consists of three parts

1. Aditus ad antrum is a short canal connecting the epitympanum with the mastoid antrum.
2. Mastoid antrum - biggest air cell in the mastoid.
3. Mastoid air cells are variable in number, size and distribution. They communicate with the mastoid antrum.

   There are three types of mastoid process:

   a. Cellular, with large and numerous air cells.

   b. Diploic, with small and less numerous air cells.

   c. Sclerotic, with air cells practically absent

   The cellular mastoid account in about 80% of subjects and is considered to be normal. The diploic and sclerotic types may be due to the blockage of the Eustachian tube. The air cells are located

mainly in petromastoid and squamous parts of the temporal bone. In a well developed mastoid they are grouped as follows

Central group- periantral cells

Peripheral group- dural

perisinus

sinodural

Tip

Retro facial

Accessory group- squamous

Occipital

Zygomatic

Peritubal

Styloid

EUSTACHIAN TUBE OR AUDITORY TUBE

It connects the cavity of the middle ear and the nasopharynx, it has two parts,

1. Bony

It measures 12 mm in length. It runs through squamous and petrous part of temporal bone. Related structure medially carotid canal, inferiorly separated from jugular Fossa, above from tensor tympani

2. Cartilaginous

It measures as 24mm length in adult. Formed partly by cartilage and partly by fibrous connective tissue. The nasopharyngeal end of the tube was wider and mucous membrane covering over this end forms a tubal elevation. The cartilage is fixed to the base of skull in a groove between petrous part and greater wing of sphenoid.

In adult lies at angle of 45 degree and in infants it forms an angle of 10 degree and in horizontal plane. In nasopharynx part, it opened little below the posterior end of inferior turbinate. The tube was lined by ciliated columnar epithelium with more goblet cell and basal cell. In the pharyngeal part, the lumen of the auditory tube surrounded by ostmann's pad of fat. Which function as closure of the Eustachian tube, Prevented from nasopharyngeal reflux.

The fossa of rosenmuller is a recess present behind the tubal elevation of pharyngeal part of tube , content seen are mainly lymph nodes and fat. In case of nasopharyngeal cancer, it is the most commonest site.

Blood supply:

Arterial supply

Ascending pharyngeal branch of external carotid and middle meningeal branch from maxillary artery and small branch from pterygoid canal artery.

Venous drainage

Drain into Pterygoid plexus of vein

Functions of Eustachian tube

1. Equilibrate the air pressure in tympanic cavity
2. Product from nasopharyngeal sound pressure and secretion.
3. Drainage of secretions from the middle ear into the nasopharynx

Physiology

Sound transmission

Intact tympanic membrane conducts a sound from EAC to ossicle. Sound wave passing through the EAC and its strikes over the surface of the tympanic membrane, from this vibration passes through ossicular chain to the footplate of stapes. This stimulates hair cells of organ of corti.

Acoustic resistance defined as Sound wave travelling from one medium (air) to another medium like water, 99.9% of sound energy is reflected. This similar impedance mechanism exit in ear (conducted sound from the air to travel to cochlear fluid). This loss of sound energy is compensated by, middle ear convert the sound of lesser force, greater amplitude to greater force and lesser amplitude. It is called impedance matching.

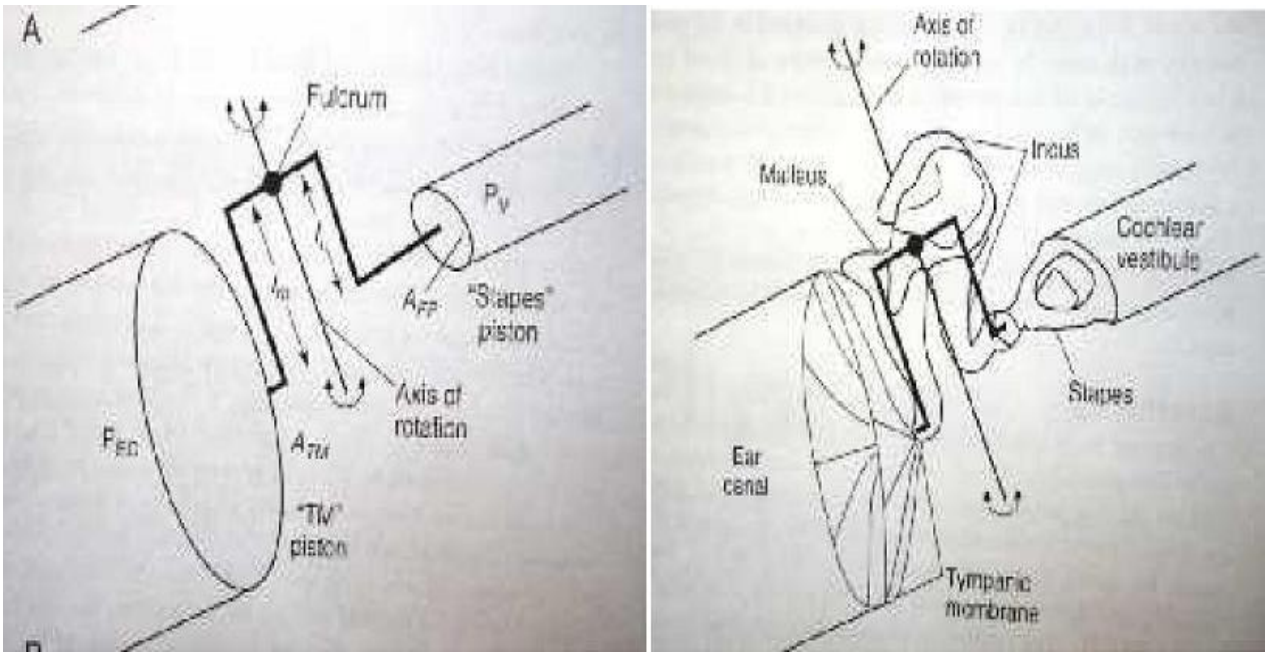


Fig-2; shows ossicle lever ratio

Impedance matching is mainly accomplished by relative large tympanic membrane surface area to foot plate of stapes and lever action of ossicle. The ratio of vibrating portion of tympanic membrane (85-90 mm square) to stapes footplate is 3.2mm square result in sound energy increased as 17:1. The malleus handle is 1.5 times longer than long

process of incus, through the use of this leverage, the force received at footplate of stapes is greater than malleus by 1.3:1 ratio. So middle ear combined transformer ratio is 22:1.

Tympanic membrane Perforation with normal middle ear ossicle and other structure affect the hearing by two different mechanisms. First one due to reduced tympanic membrane surface on which sound pressure exerted leads to ossicular chain vibration reduced .Size of the perforation increases, the surface area loss is also greater, in which sound pressure can act and through the perforation additional sound pressure entering the middle ear act on medial surface of the tympanic membrane against sound pressure on other surface.

The second mechanism result from sound reaching round window directly, This become more with larger perforation .size of perforation increases, hydraulic advantage formed by large surface of tympanic membrane over small oval window disappear , both oval and round window reached by the sound at same time with equal force and Resultant cancellation of vibratory movement.

Tympanic membrane perforation

Common causes of tympanic membrane perforation are infection like ASOM, CSOM, viral infection of drum, secondary to otitis externa and trauma.

Fig -3; shows Medium sized perforation in antero superior and anteroinferior part of parstensa; margins are regular. Exposed middle ear mucosa appears normal

ASOM(Acute suppurative otitis media):

Defined as acute inflammation of mucoperiosteal lining of middle ear cleft. Perforation in ASOM mostly in anteroinferior quadrant and rarely posteroinferior and superior quadrant and most of cases healed

spontaneously. Common organism involved are streptococcus pneumoniae, haemophilus influenza , moraxella cataralis . Persistence of perforation due to recurrent infection or organism is highly virulent.

CSOM(Chronic suppurative otitis media)

Defined as chronic inflammation of mucoperiosteal lining of middle ear cleft with permanent abnormality of the pars tensa or flaccida, likely result of earlier ASOM, negative middle ear pressure or otitis media with effusion.

Classification of CSOM :

1. Inactive mucosal CSOM (Dry perforation)

Permanent perforation of pars tensa but no inflammation seen in middle ear or mastoid mucosa. Remnant of the pars tensa membrane completely surrounded the perforation margin. Medial migration of squamous epithelium through the perforation into the middle ear .It prevents healing chronic perforation.

2. Active mucosal CSOM (Perforation with otorrhoea)

Chronic inflammation within the mucoperiosteal lining of middle ear cleft and mastoid produce active mucopurulent discharge via tympanic membrane perforation.

3. Inactive squamous epithelial CSOM (Retraction , Atelectasis):

Negative middle ear pressure result in retraction of tympanic membrane. Retraction pocket is defined as invagination of part of tympanic membrane into middle ear space .it is either fixed to the structure in the middle ear or it's freely mobile)

4. Active squamous epithelial CSOM:

It is usually associated with cholesteatoma formation

Cholesteatoma

It is defined as a sac in the middle ear, which is lined by keratinizing stratified squamous epithelium containing desquamated epithelium as keratin debris. It is also described as skin in the wrong place .cholesteatoma are dangerous because to incite bone resorption , intratemporal or intracranial complication.

Other classification:

1. Tubo tympanic type (safe type)

2. Attico - antral type (dangerous type)

TUBO TYMPANIC TYPE

Etiology

1. Predisposing factors

Inadequate / improper treatment of ASOM, infection from surrounding areas like nose, nasopharynx and oropharynx, some diseases like tuberculosis are chronic from the beginning, pneumatisation of mastoid – sclerotic mastoids are more prone for CSOM.

2. Exciting factors

Gram negative organisms like pseudomonas, proteus, E.coli Streptococcus, Staphylococcus

Symptoms

1. Discharge: Profuse, intermittent, predominantly mucoid occasionally mucopurulent, non foul smelling, whitish/yellowish and tenacious. It increases with attacks of cold.

   Depending on the discharge it is divided into four stages:

Active – actively discharging ear at the time of clinical examination

Quiescent – no ear discharge for less than 3 to 6 months period

Inactive – no ear discharge for more than 6 months.

Healed – central perforation has healed.

2. Deafness – mild conductive
3. Earache – if associated with otitis externa

Signs

1. Discharge is present in the external auditory canal which is usually mucoidal , tenacious and non-foul smelling.
2. Tympanic membrane –

A central perforation occurs in the pars tensa without any involvement of the margin of the drum. Size of the perforation will range from small to very large perforation in the pars tensa.

Small, pinpoint perforation (less than 25%) is seen in acute suppurative otitis media and also in trauma.

Medium size (25-50%) is frequently round or oval. It could be either dry or moist.

Large perforation (50-75%).

Subtotal perforation involves where all the 4 quadrants of tympanic membrane except the annulus.

Complete or total perforation when there is loss of substance involving the entire tympanic membrane including the annulus found in attico antral disease.

Middle ear can be easily visualized through a large perforation. In case of suppuration, medial wall is covered by thick red granular and sometimes polypoidal mucous membrane.

Other structures that can be identified are as follows

Promontory

Oval window

Round window niche

Eustachian tube orifice

Parts of ossicular chain

Stapedius tendon.

3. Tuning fork tests

Rinne – negative

Weber – lateralized to the affected side

ABC – normal

INVESTIGATIONS

Culture and sensitivity of the discharge in case of active stage

Examination under microscope

To see the margin of the perforation

To rule out any ingrowing epithelium

To see granulation tissue and polyp

To see any evidence of cholesteatoma

For precise collection of swab from middle ear

To rule out any hidden pin hole perforation

To see status of middle ear mucosa

To see the status of ossicular chain if possible

Pure tone audiogram – mild conductive loss between 20 to 30 db

Patch test – This test is performed as a outpatient procedure. The material used in patch test can be thin paper commonly taken from cigarette foil and which is cut into size of perforation. Before patching, a pure tone audiogram is taken. Then perforation is closed with the same cut thin paper. Patching of perforation is always better if paper is soaked in Vaseline. A repeat audiogram is done after patching.

Interpretations of patch test are

1. Improved hearing means intact ossicular chain.
2. Decreased hearing means ossicular fixity or discontinuity.

3. No improvement of means in technical fault or improper patching.

X-ray of mastoids : to rule out mastoiditis

X-ray of paranasal sinuses : to rule out sinusitis

X-ray soft tissue neck lateral view : to rule out adenoid enlargement.

Diagnostic nasal endoscopy

TREATMENT

Medical management

Aural toilet by dry mopping, wet mopping, suction cleaning. Wet mopping is discouraged nowadays. Suction cleaning is the best method but may not be possible in children.

Antibiotic ear drops after culture and sensitivity report.

Surgical management

Removal of septic foci, e.g. Tonsillectomy, adenoidectomy, sinus wash.

Myringoplasty if hearing loss is below 40 db, Tympanoplasty if above 40 db

If X-ray mastoid shows mastoiditis, do cortical mastoidectomy

ATTICO-ANTRAL OR DANGEROUS TYPE

It is usually associated with cholesteatoma formation

Cholesteatoma

It is defined as a sac in the middle ear, which is lined by keratinizing stratified squamous epithelium containing desquamated epithelium as keratin debris. It is also described as skin in the wrong place. This structure has a capacity for progressive and independent growth at the expense of underlying bone and has tendency to recur, unless removed completely.

The mechanisms of bony erosion of cholesteatoma are not completely understood. Various factors are mentioned here

1. Earlier it was thought the physical pressure of cholesteatoma causes bony erosion.
2. At the cellular level the chief factor in bony erosion is activation of osteoclasts
3. It is believed that release of inflammatory mediators such as the cytokine, interleukin 1 alpha, from macrophages and epidermal keratinocytes are being important in osteoclast activation. Other humoral factors that have been suggested are prostaglandin, cathepsin D and parathyroid hormone like protein.

In addition to bone destruction new bone formation can occur in cholesteatoma mostly seen in attic and mastoid antrum

CLASSIFICATION OF CHOLESTEATOMA

Congenital cholesteatoma

It defined as embryonic epidermal cell rests in the middle ear cleft or temporal bone. It may occur at

Middle ear

Petrous apex

Cerebellopontine angle

In middle ear, congenital cholesteatoma usually presents with a whitish mass behind an normal tympanic membrane. Sometime it ruptures through the tympanic membrane spontaneously.

Levenson criteria for diagnosis

A white mass behind intact tympanic membrane

Intact pars flaccida and tensa

No history of previous otorrhea

No history of previous ear surgical procedure

Canal atresia and intramembraneous and giant cholesteatoma

Primary acquired cholesteatoma

It occurs in the ear where there is no previous history of ear discharge from the ear or tympanic membrane perforation

Secondary acquired cholesteatoma

It always occurs in an already diseased ear where there is a pre-existing tympanic membrane perforation

ETIOPATHOLOGY

The exact etiopathology is unknown but various theories have been put forward for the formation of cholesteatoma. Cholesteatoma is a white, pultaceous mass having bone eroding capacity either by expansion or by liberation of some chemical enzyme.

Theories:

1. Retraction pocket theory (primary acquired cholesteatoma) Eustachian tube obstruction will produce negative pressure in the middle ear cavity as a result there will be formation of a retraction pocket at the attic region which will hamper the normal migratory action of the epithelium of the external auditory meatus. This will produce accumulation of the desquamated epithelium in the attic and pressure necrosis of the tympanic membrane forming cholesteatoma of the middle ear. This theory holds good in explaining the primary acquired cholesteatoma. Other theories for pathogenesis of primary acquired cholesteatoma are tubal occlusion theory by Bezold (1890), obstructed attic by embryonic

cell remnants by Wittmack (1933), embryonic epithelial cell rest by Mc Kenzie(1931).

2. Theory of migration – skin of the external auditory meatus will migrate to the middle ear cavity through the tympanic membrane perforation leading to secondary acquired cholesteatoma formation in the middle ear.
3. Metaplasia theory – because of recurrent / chronic infection normal columnar epithelium turns into squamous epithelium by metaplasia
4. Implantation theory – At the time of middle ear surgery squamous epithelium may get implanted.

Other theories of epithelial abnormality

Invasive hyperplasia of basal layer of meatal skin adjoining of the upper margin of tympanic membrane has been postulated in this theory. Papillary invasion with central cornification enters the epitympanum without tympanic membrane perforation. This speaks in favour of primary acquired cholesteatoma

Invasive hyperkeratosis and acanthosis of deep meatal skin has also been postulated.

Typical growth pattern of cholesteatoma

The most common sites of acquired cholesteatoma listed by their frequency.

Posterior epitympanum

Posterior mesotympanum

Anterior epitympanum

It is not unusual for multiple cholesteatoma sac to occur in the same ear involving two or even all three of these typical routes. While great majority of cholesteatoma follow one or more of this common pathway, others assume unusual patterns presumably because of anatomic variation of middle ear fold and the ligaments which channel the cholesteatoma growth.

Pars tensa cholesteatoma

Ossicular chains are involved at a relatively early stage. Long process of incus and stapes suprastructure is the common ossicles involved. This causes moderate to severe conductive deafness. Occasionally the hearing is well preserved by a retraction on to the stapes head or bridging of ossicular chain defect by cholesteatoma (cholesteatoma hearers).

Pars flaccida cholesteatoma

Pars flaccid cholesteatoma is frequently associated with ostitis, granulation tissue and erosion of outer attic wall or scutum. As the cholesteatoma expands the ossicular head of malleus and incus becomes surrounded by squamous epithelium. The involvement of the ossicular

chain occurs relatively late in disease process. It is not uncommon to encounter large pars flaccida cholesteatoma with an intact ossicular chain and relatively a minor degree of conductive deafness. Further progression of disease occurs anteriorly in to the anterior epitympanum and posteriorly into the mastoid antrum and its air cell system.

CLINICAL FEATURE

Symptoms:

Ear discharge: it is foul smelling scanty predominantly purulent, occasionally blood stained and has no relation with upper respiratory tract infection.

Deafness: progressive conductive deafness

Itching and pain in the ear: May be caused by otitis externa or may be an early symptoms of complication.

Tinnitus and giddiness: May be early symptoms of complication.

Sign:

Otoscopic examination reveals

1. Foul smelling discharge in the external auditory canal.
2. Granulation tissue in posterosuperior part of deep meatus.
3. Tympanic membrane shows attic, marginal or total perforation

4. Occasionally granulation tissue or polyp may be seen coming out of perforation.
5. Whitish cholesteatoma flakes can be seen through perforation
6. Mastoid tenderness present
7. Tuning fork shows the rinne test negative, weber test lateralized to the affected side, ABC normal.

Investigations

Examination under microscope

Culture sensitivity from ear discharge

Rigid otoendoscopy to see the facial recess and sinus tympani if possible

Audiogram

Imaging

1. X-ray Mastoid (Schuller's and Law's view): to see the bony erosion, to see the anatomy of mastoid, occasionally to diagnose cholesteatoma which gives the cotton wool appearance.
2. CT scan : Features seen in high resolution are the following:

    Blunting of the scutum is the earliest sign

    Erosion and destruction of lateral attic wall

    Widening of aditus

    Displacement and destruction of ossicles

Labyrinthine fistula formation

Erosion into the facial canal

Dehiscence of the tegmen tympani and sinus plate

Destruction of mastoid or natural mastoidectomy

Erosion of posterior and roof of external auditory canal

3. MRI: MRI provides complimentary information by allowing characterization of soft tissue masses.

MANAGEMENT

Aims and objective

1. Primary objective is to make the ear safe and dry
2. To restore or to improve the hearing

Surgical management

Surgical management (Mastoidectomy) is the main line of treatment in atticoantral disease. Conservative or medical line of management has no role in making the ear safe.

Medical management

In patient unfit for surgery due to medical disorder or in some cases with cholesteatoma in only hearing ear, conservative medical management is only therapeutic option with topical antibiotic and steroid.

However ideal medical treatment would be topical agent which has the potential for either eliminating the squamous epithelium or reducing its activity in order to curtail the production of desquamated debris. Studies have shown that 5- flurouracil has some useful activity in this aspect. Initial studies in which 5-flurouracil was applied to the cyst wall of early cholesteatoma, relapsing cholesteatoma and in large discharging cavity showed inhibition of keratin formation and otorrhea.

Traumatic perforation:

Trauma due to blunt or penetrating injuries, thermal or chemical injury, barotraumas, blast injuries. Iatrogenic injury may result from long period of ventilation tube (T tube) or following myringotomy. Barotrauma lead to rapid change of pressure (from 100 to 500 mmhg) causes tympanic membrane rupture. Acoustic trauma due to high sound pressure level (195 db) cause rupture of membrane. Injuries produced by slap lead to column of air trapped in external acoustic meatus, it compressed over the tympanic membrane lead to perforation.

Fig-4; Shows traumatic perforation of the left tympanic membrane with congestion; margins are irregular.

Longitudinal temporal bone fracture commonly involves the tympanic membrane than temporal bone fracture. Penetrating injuries is mostly self inflicted like self cleaning the ear canal with cotton swab or stick .Traumatic injury lead to perforation has more tendencies to heal spontaneously in case of 78-90%

Healing process:

Tympanic membrane has ability to heal by itself after any insult . Rate of healing depend upon the cause of perforation .Traumatic

perforation heals spontaneously up to 79-90%. Acute otitis media has healed upto 79%. Thermal injury healed up to 38% .Many factor affect the healing process like age > 30,size of perforation (large) ,location and cause of perforation like posterosuperior ,anterior to handle of malleus, recurrent URI, allergic sensitization of middle ear mucosa , infection ,previous acute episode of necrotizing otitis media or any malnutrition , immunosuppression .

Healing process of tympanic membrane depend on epithelial migration. Two types of migration seen. In centrifugal type, movement from umbo outwards, for removal of keratin wax outward. In centripetal type, mainly responsible for healing process .After injury to the tympanic membrane, mitotic activity increased around the annulus and 2mm away from the wound margin. Healing is regulated by cytokines such as EGF and beta TGF. These factor accelerate the regeneration of epithelium.

Historical aspect:

Helmoltz first described the middle ear transformer mechanism. All the reconstructive procedure of middle ear is based on this transformer mechanism. Banzer in 1640 attempted the tympanic membrane repair using pig's bladder as an artificial the tympanic membrane, meanwhile various operation on mastoid were being improved to removal of chronic infection. In 1853 toynbee placed a

rubber disc attached to silver wire over tympanic membrane perforation with more improvement of hearing .In 1863 yearsly improved hearing by cotton ball placed over the site of perforation.

Blake (1879) placed patch of paper over the perforation, it is still used as a test to screen the ossicular chain defect in tympanic membrane perforation. Roosa and okencuff promote healing by chemical cautery using trichloroacetic acid and silver nitrate. With advent of introducing operating microscope detailed examination of ear and use of instrument for manipulating the drum and ossicle was possible. Derlacki introduced repairing the tympanic membrane perforation as office procedure using repeated cautery with success rate of 84%. Berthold 1878 coined the term myringoplastik, used plaster to de-epithelize the drum before placing a full thickness skin graft. Tympanoplasty then popularized by wullstein and zollner, using split thickness graft. Full thickness and split thickness skin graft was originally used , has been replaced by other graft material due to increased reperforation secondary to subsequent infection and desquamation.

All myringoplasty was initially overlay technique using split thickness skin graft. Due to sweat and sebaceous gland present in skin prone to infection and induced cholesteatoma formation. In 1960, Shea and Tabb first used vein graft. Initially graft uptake was good and later,

the graft tended to atrophy after a few months. Heermann introduced temporalis fascia as graft material. It was universally accepted. It become a standard due to ideal handling properties, close resemblance to middle layer of tympanic membrane , easy availability, rarely it undergoes atrophy when middle ear aeration is not proper . Goodhill used perichondrium for grafting. Result more similar to temporalis fascia graft. It was not widely used because limited availability, not easily harvested. Homograft material first used for tympanic membrane perforation by Marquet. The success rate was similar to temporalis fascia, risk of transmission of infection and HIV has limited the use of the material.

Tympanoplasty in children:

Otologic surgery in children has less successful compared to adults. Success rate for pediatric Tympanoplasty are reported from 35-93% due to more incidence of Eustachian tube dysfunction and frequent URI and otitis media in children as the reason for poorer result. The failure rate in children due to following reason

1. Narrow External auditory canal and technical difficulty is more frequent in children than adults.
2. Eustachian tube function is not well developed in children.
3. Frequent upper respiratory tract infection and frequent episode of otitis media is more common in children

4. Poorer long term result occur in children than in adult including high reperforation rate.

Techniques:

Preoperative assessment:

It includes complete history taking and otologic examination. History regarding hearing loss, duration of ear discharge , or infection , h/o previous surgery in ear , tinnitus, vertigo , pain in ear and facial paralysis. All previous operative reports must be reviewed, although they may not reflect the current status of middle ear. History of comorbid condition such as diabetes, hypertension, heart, and lung and kidney disease should be documented to determine, if the patient needed preoperative medical attendance.

Examination of pinna and external auditory canal should be done for any evidence of pathology, if present and should be treated. Examination of tympanic membrane using microscopic and otoscopic method to evaluation of the perforation size, location , extent, middle ear mucosa, any TM sclerotic patch , status of annulus and ossicle, presence of cholesteatoma, continuity of lateral attic wall are all evaluated.

Audiometric evaluation include tuning fork test, pure tone audiometry, speech audiometry, when ear is dry, accurate audiometric

evaluation is achieved. This means placing the patient on ear drops with or without oral antibiotic for 10-14 days. Strict dry ear precaution should be employed

Patch test using cigarette silver paper was performed. Paper was cut slightly bigger than size of perforation and applied over the drum. Patching of perforation is better if paper soaked in liquid paraffin or Vaseline using microscope. Pure tone audiogram was performed to assess the improvement of hearing. Improved hearing means intact ossicular chain. If decreased hearing means patient have associated ossicular discontinuity or fixity.

Discussed extensively with the patient about the objective of medical and surgical management of tympanic membrane perforation. The indication for the surgery include chronic or recurrent otitis media, conductive hearing loss due to tympanic membrane perforation or ossicular dysfunction, progressive loss of hearing due to chronic middle ear pathology following perforation or persistent hearing loss for more than 3 month following trauma and unable to participate in water sports or bath safely due to perforation of tympanic membrane.

Myringoplasty- Surgical procedure:

It is considered that fastest and safest way to reconstruct a tympanic membrane perforation. The two accepted techniques for grafting in myringolasty are

1. Overlay technique or lateral grafting
2. Underlay technique or medial grafting.

Overlay myringoplasty and underlay myringoplasty are defined in relation to tympanic membrane remnant .After clearing the squamous epithelium over the tympanic membrane; the temporalis fascia placed over the remnant tympanic membrane with fibrous annulus is termed as overlay myringoplasty. If temporalis fascia graft placed under the remnant tympanic membrane with fibrous annulus either circumferentially (360 degree) or partially, it is termed as underlay myringoplasty.

Overlay technique was popular in late sixties and seventies , but now most of the surgeon not preferred this technique because of postoperative complication like lateral migration of fascia , anterior blunting , squamous epithelium is not completely removed over the remnant tympanic membrane lead to epithelial pearl formation under the neotympanum.

SURGICAL APPROCHES:

1. **Transcanal myringoplasty**
2. **Postaural myringoplasty**
3. **Endaural myringoplasty**

Transcanal myringoplasty

Indication:

1. Through endoscopic method of myringoplasty
2. Small to moderate dry central perforation of tympanic membrane with wide external auditory canal
3. Postoperative residual small perforation in anterior quadrant without any anterior bulge

Surgical Technique:

STEP 1. HARVESTING OF TEMPORALIS FASCIA

A limited endaural incision made, it extend along the helicotragal groove is placed to harvest temporalis fascia graft.

STEP 2: TRANSCANAL EXPOSURE

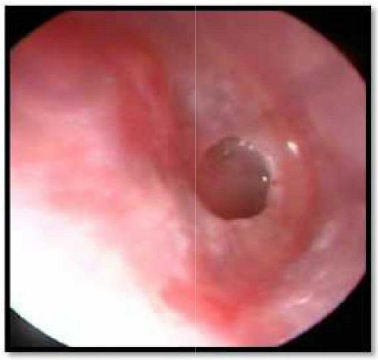


Fig-5; Shows central perforation of the tympanic membrane (RT Ear) exposed.

If microscope used self-retaining canal retractor can be used to expose the bony canal and tympanic membrane.

STEP 3: FRESHENING THE MARGIN OF PERFORATION

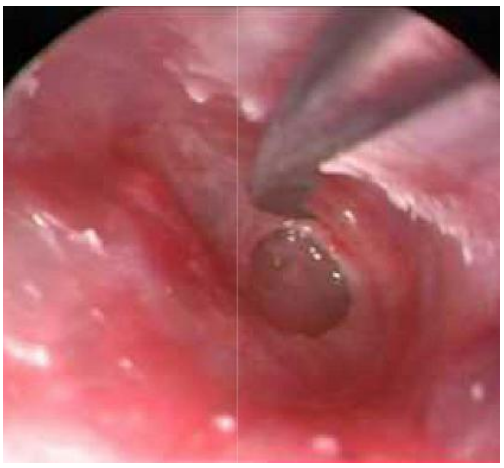


Fig-6; Freshening of the perforation margin

The margins of perforation are surrounded by squamous epithelium. It prevent graft uptake. So it is freshened using sickle knife and removal of rim using micro scissors.

STEP 4: CANAL INCISION AND ELEVATION OF TYMPANOMEATAL FLAP

The canal incision is based on location of perforation like anterior or posterior. For posterior perforation, u shaped incision made in bony canal wall. Superior incision made 11o'clock position in left ear (1 o' position for right ear), anterior and above to lateral process of malleus, extend up to the bonycartiliginous junction. Inferior incision made at 7 o' clock position in right ear (5 o' clock position in left ear), just lateral to annulus and join with the superior incision.

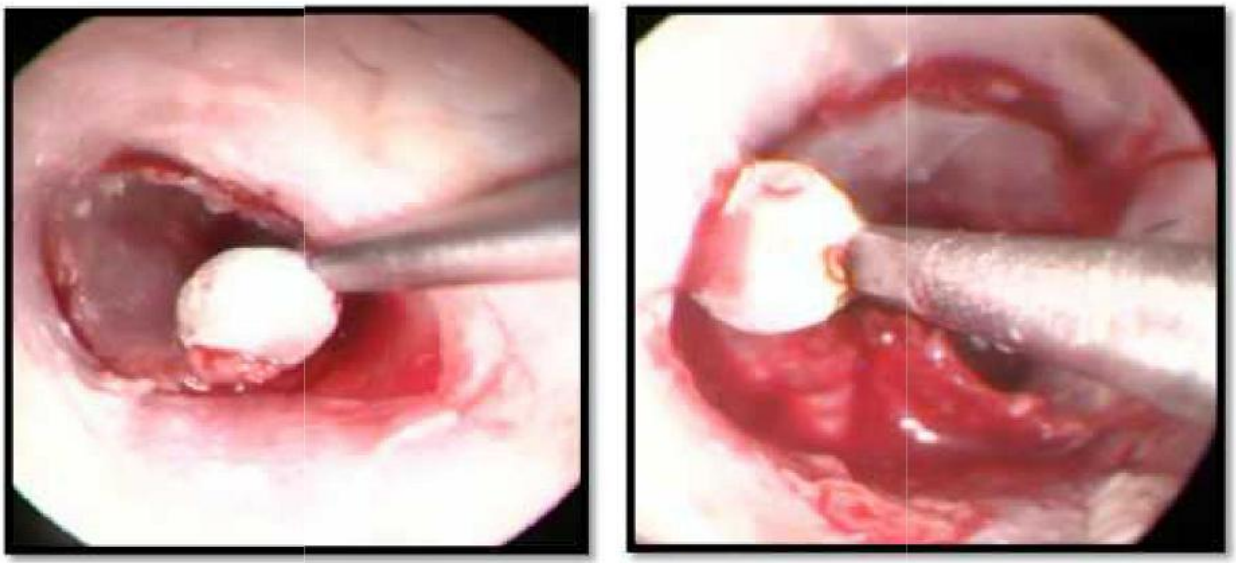


Fig-7; Canal incision and elevation of tympanomeatal flap

Tympanomeatal flap elevated, middle ear entered. If perforation is only in the posterior quadrant, skeletonize the malleus handle is not needed but perforation is extended anteriorly skeletonizing is performed for supporting the temporalis fascia. For anterior perforation superior incision at 12 o'clock position in both ear, inferior incision start at 4 o' clock position in right ear (8 o' clock in left ear). It gives easy accessibility to reach anterior perforation

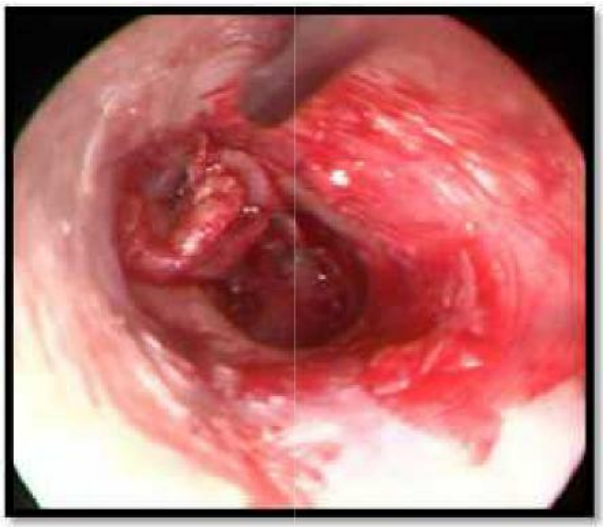


Fig-8; Exposure of middle ear

STEP 5: ASSESSMENT OF OSSICULAR CHAIN

Each ossicle assessed individually for mobility.

STEP 6: GRAFT PLACEMENT:

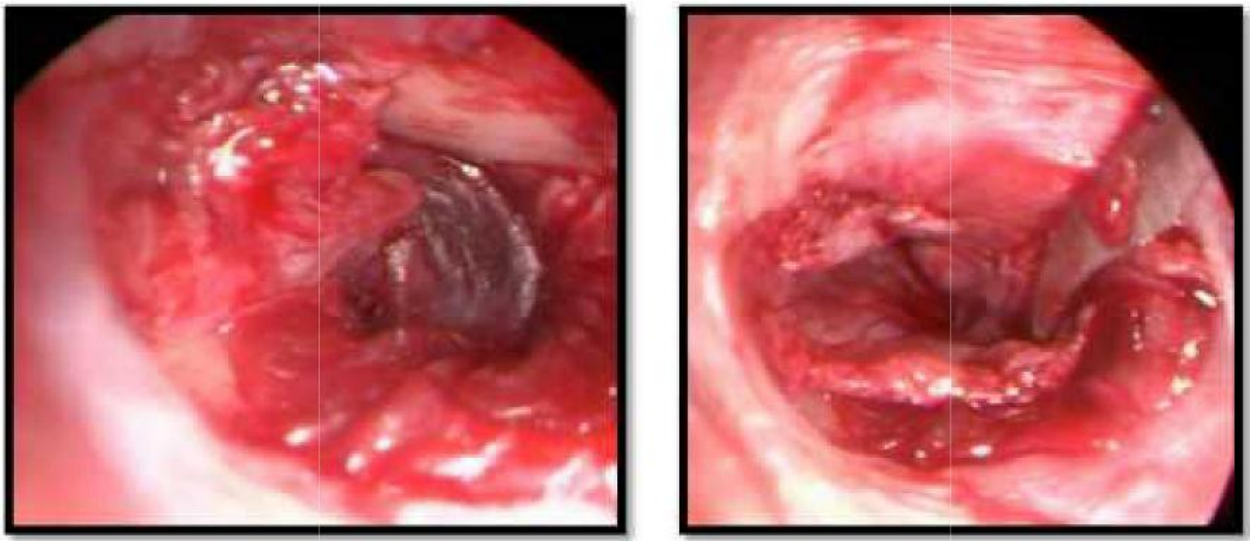


Fig-9; Placement of graft by underlay technique

Graft bed prepared by filling the middle ear with ointment soaked gel foam. Temporalis fascia graft kept under anterior remnant of tympanic membrane either lateral or medial to malleus handle and over the posterior canal wall. Tympanomeatal flap repositioned, graft stabilized by keeping the gel foam pieces. External auditory canal is filled with medicated aural pack.

POST-AURAL MYRINGOPLASTY:

Indications;

Central perforation , irrespective of size of perforation, particularly in narrow external auditory canal.

Surgical technique:

Inferior vertical Canal incision starts at 7 o’ clock position in right ear (5 o’ clock in left ear), 5mm lateral to annulus using circular knife. Similarly superior incision is made at 11 o, clock (1 o’ clock in left ear). Horizontal incision made parallel to annulus joined the superior and inferior incision. Posterior meatal skin flap elevated laterally up to bony cartilaginous junction.

FIG 10.Posterior meatal skin flap elevation

Postauricular incision made, temporalis fascia graft harvested, vertical subcutaneous incision at the posterosuperior bony meatus to expose the tympanic membrane.

FIG11. POSTAURAL INCISION

Middle ear exposed from tympanosquamous suture to the tympanomastoid suture. Superior and inferior tympanomeatal incision made. Perforation margin freshened and undersurface of tympanic membrane is scraped using plester's side knife.

If anteriorly narrow or absent remnant tympanic membrane, stabilization of temporalis fascia graft is very difficult. So anterior canal window created in anterior bony meatal skin at 3'o clock position 1mm lateral to fibrous annulus .After placing the temporalis fascia graft, pulled through this anterior window to stabilize the graft and to prevent falling of graft medially.

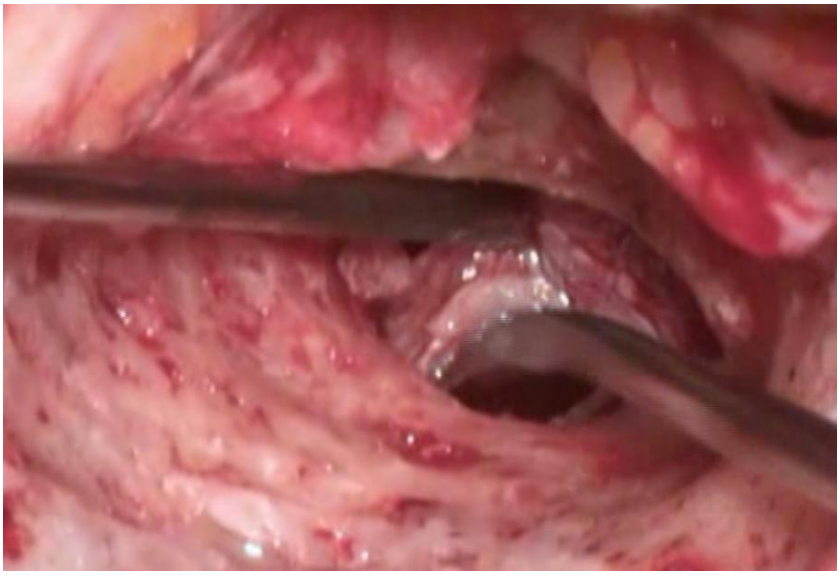


FIG 12:EXPOSURE OF MIDDLE EAR

Tympanomeatal flap elevated anteriorly, skeletonizing the malleus handle, assessment of ossicular chain movements in continuity and individual movement and its structure.

FIG13.GRAFT PLACEMENT

Removal of pathology followed by preparation of graft bed, temporalis fascia kept by underlay technique. Fascia derives blood supply from

underlying bony meatal wall, posterior meatal flap, tympanomeatal flap. Repositioning of tympanomeatal flap and posterior meatal skin flap. Postaural wound closed with 3-0 plain catgut suture.

FIG14: REPOSITIONING OF TYMPANOMEATAL FLAP

In microscopic approach, some condition like narrow external auditory canal , needs canaloplasty. It is defined as circumferential widening of inferior, anterior and posterior bony canal wall to visualization of entire tympanic membrane and annulus to proper placement of fascia graft under direct vision.

ADVANTAGES OF MEDIAL GRAFTING

1. Ideal grafting for Easy visualized and small perforation.

2. Technically less demanding and less time consuming than overlay technique.

3. Avoid complications like tympanic membrane lateralization and blunting.

DISADVANTAGE

1. Anterior meatal recess is less visualized compared to lateral grafting

2. Middle ear space volume is reduced, particularly in cases with severely diseased middle ear mucosa

3. When bed size of graft is limited secondary to large anterior marginal perforation, increased failure rate occurs.

ANTERIOR HITCH TECHNIQUE

In this technique, graft is placed medial to annulus, but lateral to handle of malleus. Has shown to be of use when perforation in anterior to handle.

ADVANTAGE OF LATERAL GRAFTING

1. Anterior meatal recess is well exposed.

2. Middle ear space not gets reduced.

3. Drum is replaced intact at the end of procedure.

DISADVANTAGES OF LATERAL GRAFTING:

1. More complications like lateralization of graft , anterior angle blunting , epithelial pearl formation or cholesteatoma formation.

2. Delayed healing up to 4-8 weeks.

POST-OPERATIVE CARE

Mastoid dressing removed the following day. Alternate day dressing over the incision site and topical antibiotic ear drops twice daily. Removal of suture on 7th POD. Advise to follow dry ear precaution and avoid activity to increase middle ear pressure for initial days. Patient follow up after 3 weeks for examination to ensure that adequate healing has began. Next visit again at six weeks to evaluate the complete healing an audiogram done at this time or third month postoperatively.

RESULTS:

1. CLOSURE OF PERFORATION:

Ideally all myringoplasty effort should result in an intact tympanic membrane. Patient with clean dry ear with normal Eustachian tube function, tympanic membrane grafting should be successful routinely. Failure of graft uptake, one must attempt to determine, failure was due to technical error or infection or poor Eustachian tube function. First two

reasons are often amenable to revision surgery. If poor Eustachian tube function and recent otorrhoea, require a revision tympanomastoidectomy.

Most authors report a success rate of 90%. Most authors reported less success with anterior perforation closure. Recent studies show that anterior position of tympanic membrane is less vascular. They recommend autologous temporalis fascia graft in this area, because it is less antigenic, low BMR, better able to withstand prolong anoxia.

HEARING:

Anatomical and technical factor responsible for postoperative hearing result. The mucosal status of middle ear was most important predictive factor. The manubrium mallei presence was second most important factor, it allows proper adaption of graft and increase the stability. Tympanic membrane perforation less than 50% of the drum has significantly better than larger one. Halik and symth recommended final air-bone conduction threshold less than 30 db or within 15 db of the other ear to benefit from sound localization and binaural hearing.

COMPLICATION:

The complication usually a result of two factors. One is extent of destruction by disease process, exposing vital structure to injury. 2nd factor due to surgical accident.

1. Infection.

2. Failure of graft uptake.

3. Chondritis.

4. Drum cholesteatoma or epithelial pearl formation.

5. Chorda tympani nerve injury.

6. Vertigo.

7. Sensory neural hearing loss

8. Conductive hearing loss.

9. Laterlization of graft.

10. Anterior blunting of graft.

Microscopic assisted myringoplasty:

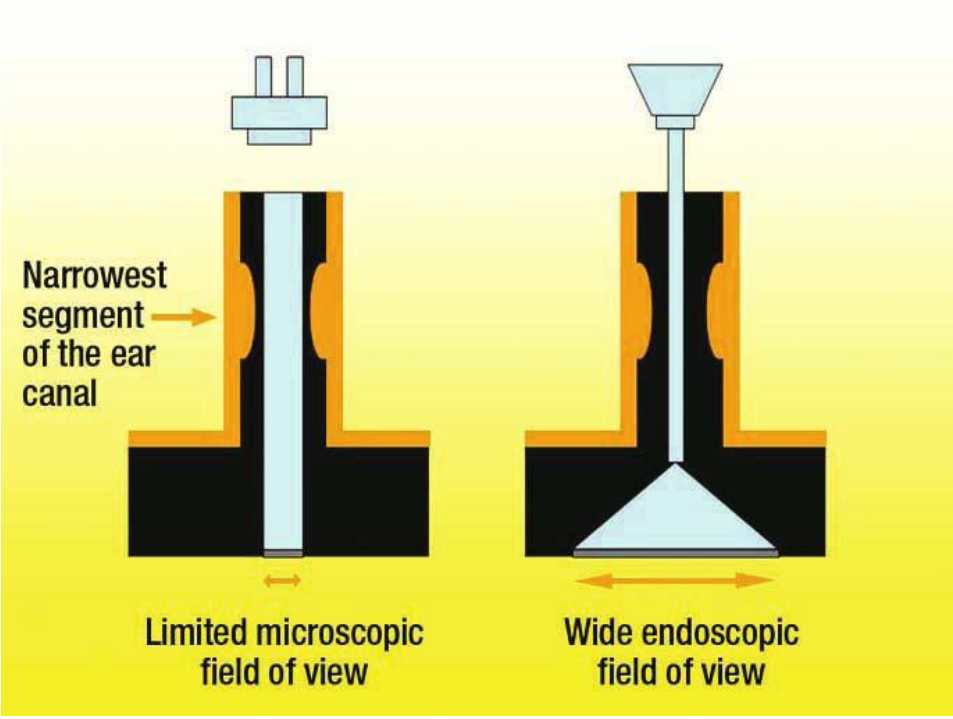


Fig-10; Microscopic and endoscopic view of tympanic membrane

The advent of introducing the operating microscope, result of myringoplasty started showing dramatic improvement. This is attributed to accuracy of surgical technique.

Classically, a lens for working 250mm is used for ear surgery with magnification of 10, 16, 25 and 40. Strong light is needed because of depth and narrowness of the ontological operating area .Modern operating microscope fitted with efficient xenon light source .The spatial positioning is of greater importance .In ear surgery, angle of view is

constantly changing, particularly with transcanal approach, which causes relatively wide microscope movement .

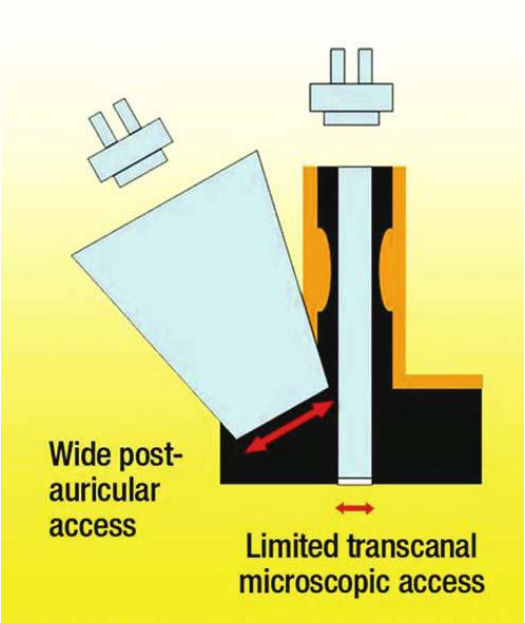


Fig-11; Microscopic view of tympanic membrane through post auricular access

Advantage of microscopic assisted myringoplasty:

1. Depth of perception is more.

2. Binocular vision.

3. Both hands available.

Disadvantage of microscopic assisted myringoplasty:

1. Magnified vision in straight line.

2. In narrow external auditory canal or tortuous external auditory canal , not able to visualize whole tympanic membrane ring and ear canal at same time.

3. Continuous repositioning of patient and surgeon's head and microscope

4. Hidden structure like sinus tympani, facial recess , attic, hypotymanum not visualized.

Endoscopic middle ear surgery :

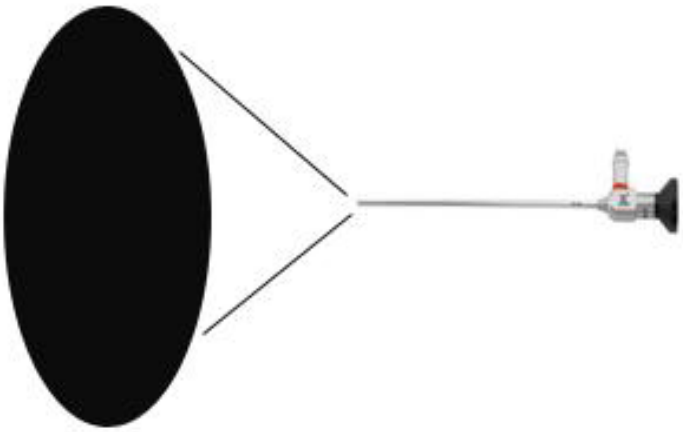


Fig-12; Wide angle view of endoscope

The endoscope increases the surgeon's ability to understanding of the disease process and its extension and compared to the microscope, it provides a wide field of view of the middle ear**.** The transcanal access in microscopic view is defined and limited by the narrowest segment of

the ear canal . This limitation makes a surgeons to create a parallel port via a postauricular transmastoid approach to gain k access to the middle ear, facial recess, and hypotympanum. Transcanal endoscopic procedure, however bypasses the narrow segment of the ear canal and provides a wide view of middle ear ,so surgeons able to look "around the corner," even with a zero-degree endoscope is used.

Instrumentation:

Eighteen cm long, 4mm in diameter, wide-angled, zero-degree and 30-degree Hopkins rods are most often used. Recently endoscope of size 3mm has been introduced. Video equipment attached with 3-chip video camera and a monitor. Directly visualizing the monitor, procedures are performed and recorded. Standard microscopic middle ear surgery instruments are used .

The first published description of visualization of middle ear by using endoscope was by mer and colleages in 1967. They passed a fibreoptic instrument through existing tympanic membrane perforation in two patients, but the image resolution of their instrument was limited. Eichner obtained much improved images using 2.7 mm diameter rigid endoscope. Nomura introduced the concept of middle ear exploration by passing a rigid endoscope through myringotomy in an otherwise intact tympanic membrane.

Poe and colleagues described the use of 1.9 mm rigid endoscope through a myringotomy to aid in the diagnosis of perilympatic fistula. Thomassin and colleagues developed successful rigid endoscopic technique as an adjuvant to conventional cholesteatoma surgery , dramatically reducing the residual rate of disease.

The endoscope lens brings the surgeon view into the depth of the operative field and can provide a wide field of view with perspectives not possible through surgical microscope . Additional angulation of view is accomplished by placing prism on the end of endoscope. Surgical morbidity and operating time can be substantially reduced. Endoscopy within the middle ear may be done through a myringotomy , offering spectacular in viva examination free of artifact of blood , tissue, transduates and injected local anaesthetic agent .

Accordingly, endoscopy may be useful for various diagnostic purposes such as perilympatic fistula exploration . Endoscope also improve the abilty to inspect the entire middle ear after cholesteatoma removal, reducing cholesteatoma residulal rates.

Shorter endoscopes less than 16 cm are difficult to use in otologic procedure, because the bulky eyepiece and camera are too close to the ear and are within range of movement of the hand holding the operating

instruments. The 4 mm diameter of the scope had not been a limiting factor even in smaller ear canal.

Safety issues with endoscopic ear surgery :

Thermal injury:

While the tip of endoscope heated up very quickly, same time cooled down fastely too. To protect from thermal injury scope tip cooled with savlon (antifog) solution.

Trauma:

Trauma mostly by the tip of the endoscope due to accidental head movement. So movement of head restricted while doing surgery.

Advantages of endoscope :

1. It provides an excellent magnified image with a good resolution

2. With minimal effort it can be used to visualize the nook and corners of middle ear cavity

3. Magnification can be achieved by just getting the endoscope closer to the surgical field

4. Antero inferior recess of external auditory canal can be visualized using an endoscope

5. Middle ear cavity can be visualized easily using an endoscope. Even difficult areas to visualize under microscopy like sinus tympani, facial recess attic, and hypotymanum can easily be examined using an endoscope .

6. Complete view of middle ear , tympanic membrane , and ear canal without the need for continuous repositioning of the surgeon's head and the microscope .

Major Disadvantages:

1. One hand technique, left hand is used to held the endoscope, so only right hand is used to operate.

2. Steep Learning curve

3. The loss of depth perception and monocular vision.

MATERIALS AND METHODS:

The present study was conducted in department of otolaryngology in Madurai medical college from the time period of June 2013-may 2014. A total of 40 patient within the age group of 15-60 years suffering from chronic suppurative otitis media of tubotympanic variety with dry central perforation .

1) DESIGN OF STUDY : Randomized prospective study

2) PERIOD OF STUDY : 1 year

3) SELECTION OF SUBJECT : Age between 15-60 year (Both sexes)

4) **INCLUSION CRITERIA:**

Subjects with tympanic membrane central perforation due to CSOM or trauma

Subjects with conductive hearing loss due to CSOM or trauma

Subjects with inactive and quiescent CSOM

Age between 15-60 year of both sexes

5) EXCLUSION CRITERIA:

1. Patients with active discharge

2. Patients with mastoiditis

3. Patient with sensorineural hearing loss

4. Patients with cholesteatoma.

METHODOLOGY:

All the eligible patients who satisfied the inclusion criteria mentioned below are recruited into the study. Otoscopic examination and tuning fork tests, and pre operative PTA will be done to know the perforation, degree of hearing loss, air bone gap.pre op routine investigations will be done .Patients are selected based on the otoscopy examination of EAC. Patients were selected for particular procedure according to computer generated random table. Post operative outcomes such as % of graft uptake ,improvement in hearing, air bone gap closure, post op hospital stay in two groups are measured and correlation between two will be done.

INVESTIGATION CARRIED OUT IN THE STUDY:

1. Routine pre op blood investigations such as Hb , BT,CT,HIV.

2. Audiometric analysis

Audiometry was consigned to an audiologist who is blinded to the study. Air conduction and bone conduction was performed . Average Air bone gap of each patient was calculated preoperatively and postoperatively at a frequency 500hz, 1000hz, 2000 hz. Audiometric evaluation was also to evaluate the cochlear reserve of patient and also for documentation.

3.CT Scan mastoid

4.Otomicroscopy and otoendoscopy.

Patient were admitted day before surgery , brief history taken , local examination of ear, nose, throat done as per attached proforma. Informed written consent obtained.

ANESTHESIA:

All cases done under the local anesthesia. Xylocaine sensitivity test done for all patient by injecting 0.2 ml of 2% Xylocaine subcutaneously in medial surface of forearm and after ten minutes looking for reaction .

PREOPERATIVE SEDATION :

Premedication given half an hour before the surgery. Injection pentozocine 30mg , promethazine 25mg, atropine0.4 mg given for sedation .

OPERATIVE TECHNIQUE :

The operated ear was painted with povidone, betadine and methylated spirit. After draped ensure complete asepsis. Local infiltration given in external auditory canal at bonycartiliginous junction, and post auricular area using 2% Xylocaine with 1: 10,0000 Adrenaline . Supra auricular incision made above the hairline, temporalis fascia graft harvested. Through post auricular approach, fascia graft harvested through the same incision. It spread on a bowel and dried. In endoscopic method, rigid endoscope of 4mm in diameter, o degree angle of view, 100 mm in length was used. In microscopic assisted method, used microscope with lens distance 250 mm with magnification 10 used. Freshening of perforation done, undersurface of tympanic membrane scraped, canal incision made, tympanomeatal flap elevated, middle ear exposed, ossicle integrity and movement checked. Gel foam bed created, graft placed by underlay technique. Flap repositioned. Canal packed with antibiotic soaked cotton ball. In microscopic assisted method , if patient with tortuous canal , canaloplasty done, if narrow canal , through post auricular approach , myringoplasty done.

POST OPERATIVE PERIOD :

On the day of surgery, Iv antibiotic (Injection ceftriaxone 1g iv bd), analgesic, tablet cetrizen 10mg given. Most transcanal approach patient

discharged on following day. All postauricular approach patient discharged on 7th pod after suture removal.

Patient called for follow up at end of the week for examination and then 1st, 3rd and 6th month. Post operative audiometry taken at 6th month.

Following parameter are checked post operatively:

Primary parameter :

1. Graft uptake at 6th month- categorized as intact tympanic membrane or failure.
2. Post operative hearing at 6th month . post op air – bone gap was considered as objective method to assess the hearing improvement. They grouped as < 10 db , 11-20 db,21-30 db and above 30 db .

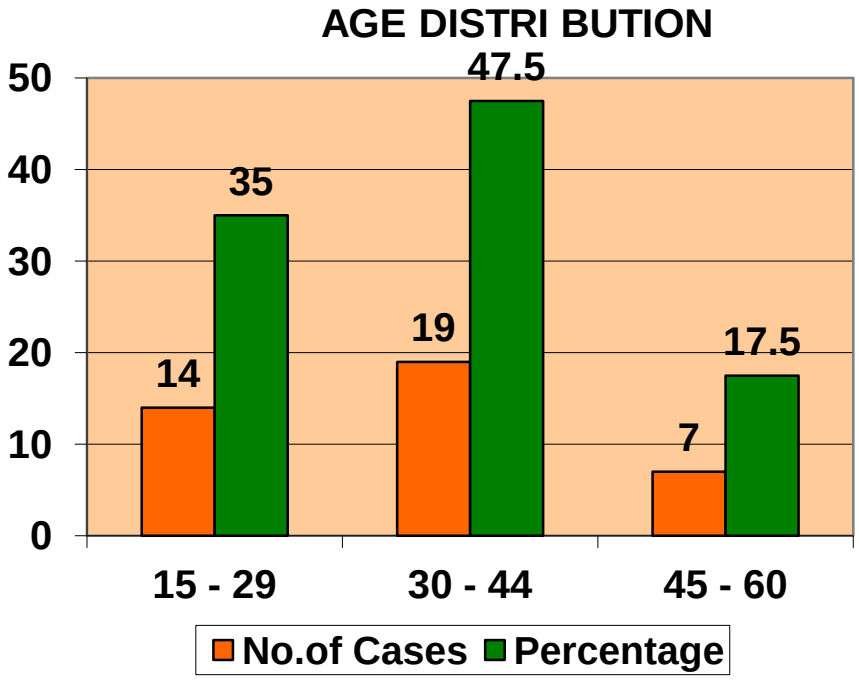
Secondary parameter :

Postoperative complication : If any complication was looked for and treated.

RESULT AND OBSERVATION:

TABLE-1 AGE DISTRIBUTION OF PATIENT OF SAFE CSOM:

1.Age Distribution		
AGE	No.of Cases	Percentage
15 - 29	14	35
30 - 44	19	47.5
45 - 60	7	17.5
TOTAL	40	100

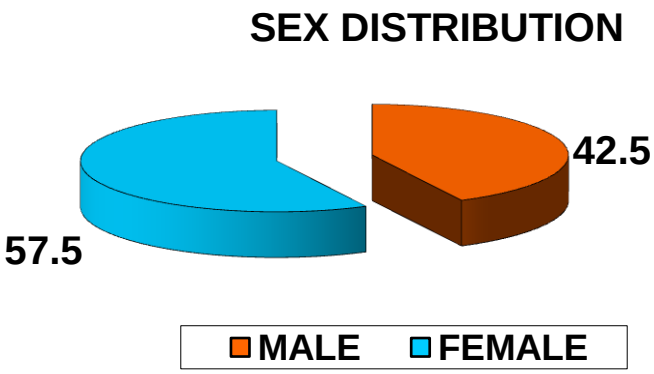


Out of 40 patient in this study, this table no.1 and chart shows 14 cases (35%) were in 15-29 years, 19 cases (47.5%) were in 30-4 4 years. 7 cases (17.5%) were in 45-60 years.

TABLE-2

SEX DISTRIBUTION OF PATIENTS OF TUBOTYMPANIC TYPE OF CSOM:

2.Sex Distribution		
SEX	No.of Cases	Percentage
MALE	17	42.5
FEMALE	23	57.5
TOTAL	40	100

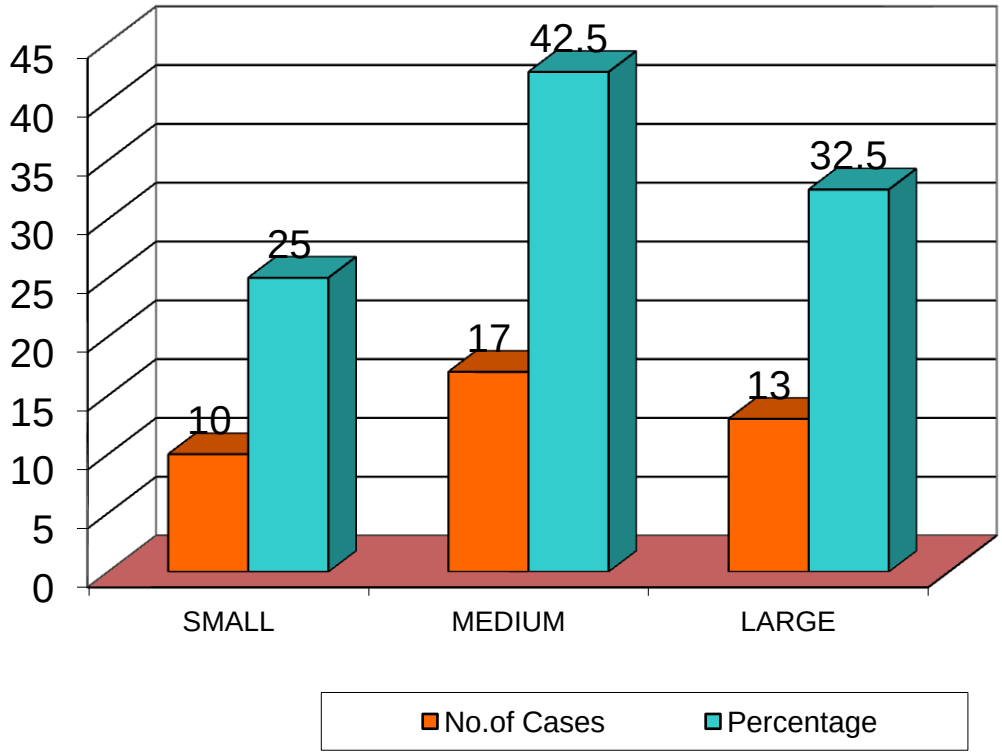


Out of 40 patients, this table no.2 and chart shows females were 23 cases (57.5%), males were 17 cases (42.5%). Females comprising more than male in this study.

TABLE -3

Distrubution of cases based on size of tympanic membrane perforation:

TYMPANIC MEMBAREN PERFORATION SIZE	No.of Cases	Percentage
SMALL	10	25
MEDIUM	17	42.5
LARGE	13	32.5
TOTAL	40	100

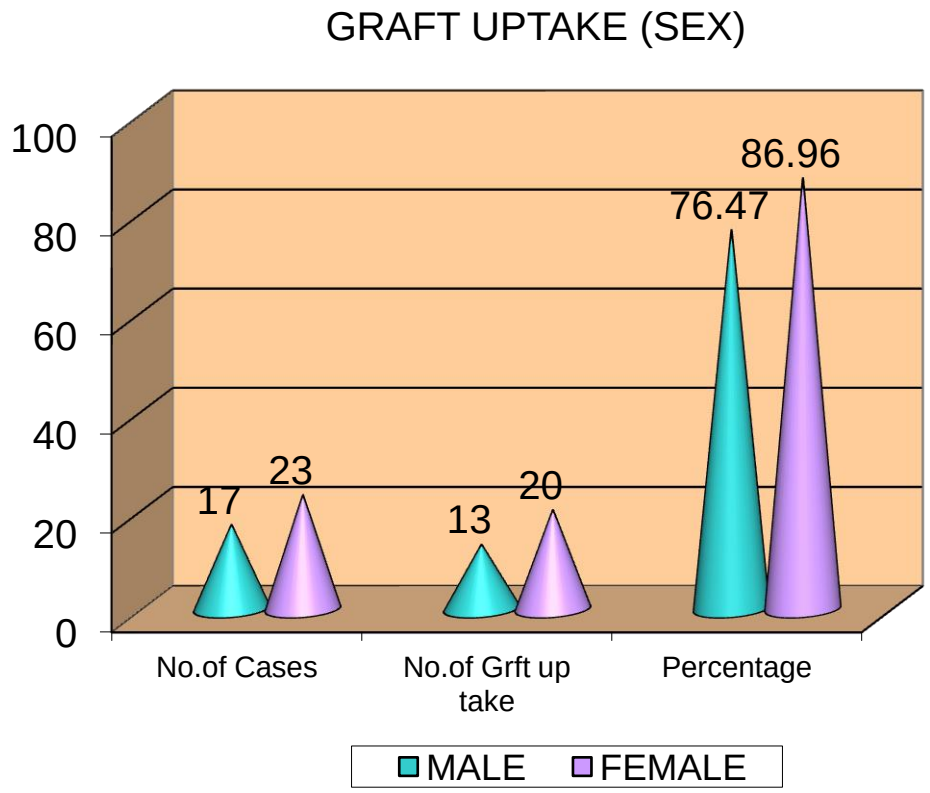


Out of 40 patients , this table n0.3 and chart shows small perforation seen in 10 cases(25%), medium size perforation seen in 17

cases(42.5%), large size perforation seen in 13 cases(32.5%).In this study more number of cases seen in medium size of perforation .

TABLE 4: TOTAL NO. OF GRAFT UPTAKE:

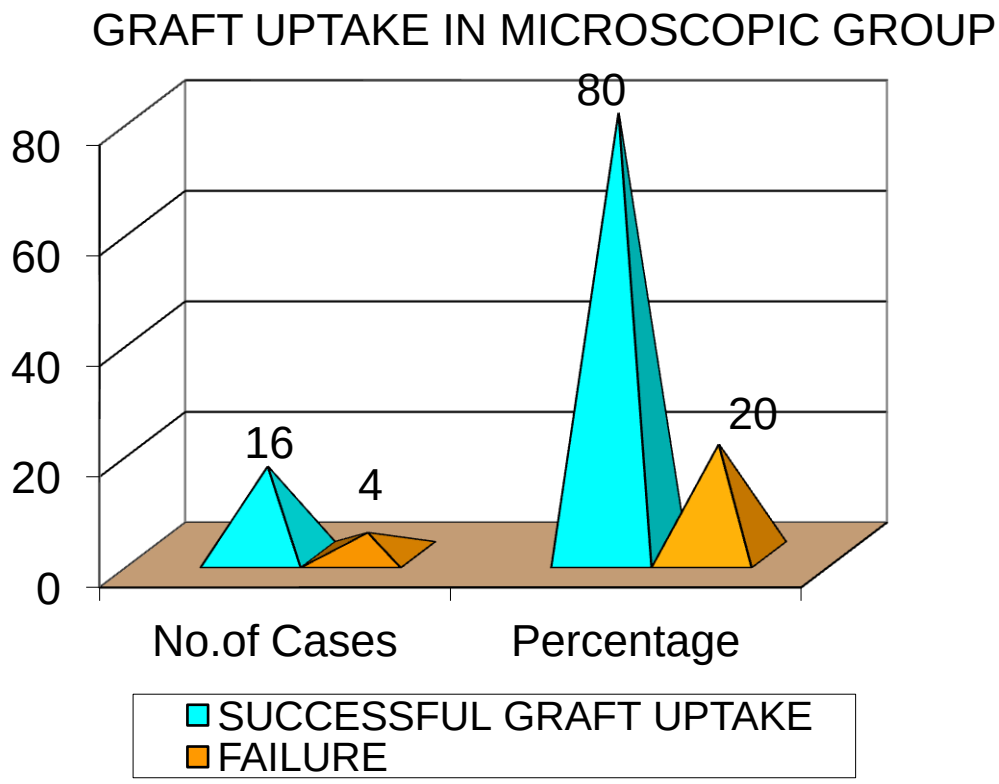
GRAFT UPTAKE	No.of Cases	No.of Grft up take	Percentage
MALE	17	13	76.47
FEMALE	23	20	86.96
TOTAL	40	33	82.50



Out of 40 patients, this table no.4 and chart shows 33(82.5%) patient had successful graft uptake. Failure in 7 cases. Out of 23 females, 20 patients (86.96%) had graft uptake. Out of 17 male cases, 13 cases (76.47%) had graft uptake. Compared to males, females had more graft uptake rate.

Table 5 PERCENTAGE OF GRAFT UPTAKE IN MICROSCOPIC GROUP:

Microscopic Group	No.of Cases	Percentage
SUCCESSFUL GRAFT UPTAKE	16	80
FAILURE	4	20
TOTAL	20	100

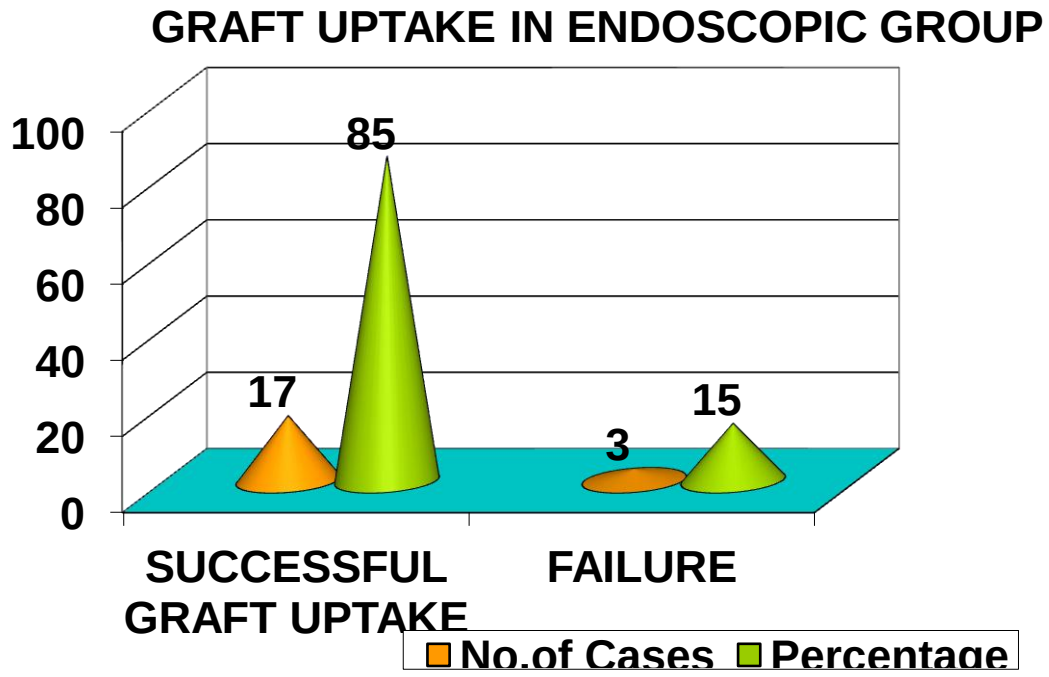


Out of 20 patient, this table no.5 and chart shows undergone microscopic assisted myringoplasty, 16 patients (80%) had successful graft uptake. 4 cases (20%) were failure of graft uptake.

TABLE 6

GRAFT UPTAKE IN ENDOSCOPIC METHOD:

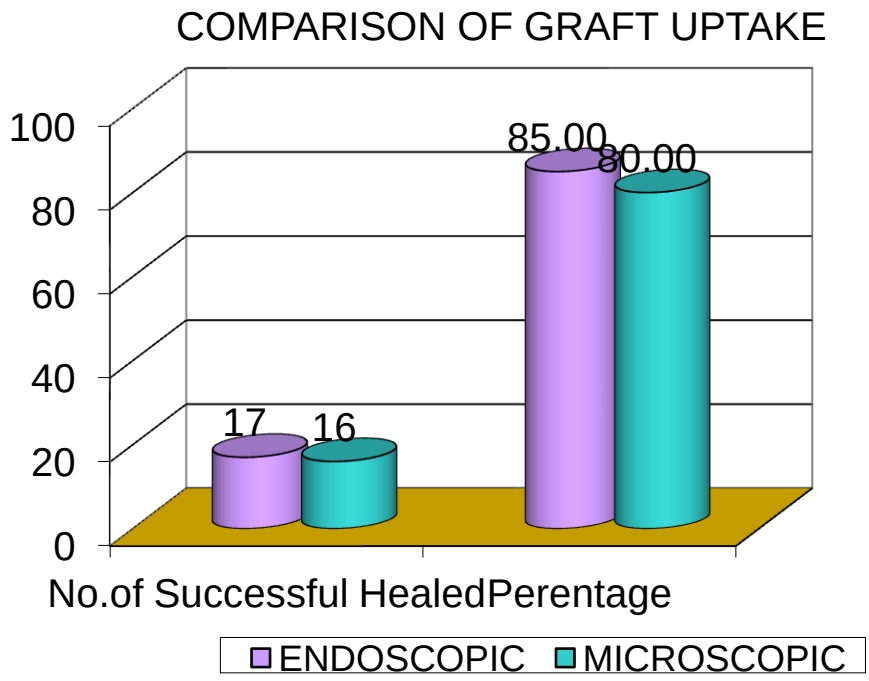
Endoscopic Group	No.of Cases	Percentage
SUCCESSFUL GRAFT UPTAKE	17	85
FAILURE	3	15
TOTAL	20	100



Out of 20 patient this table no.6 and chart shows undergone endoscopic assisted myringoplasty, 17 patient (85%) had successful graft uptake. 3 cases (15%) were failure of graft uptake.

TABLE 7 COMPARISION OF GRAFT UPTAKT BETWEEN ENDOSCOPIC AND MICROSCOPIC GROUP

GRAFT UPTAKE	No.of Cases	No.of Successful Healed	%
ENDOSCOPIC	20	17	85.00
MICROSCOPIC	20	16	80.00
TOTAL	40	33	82.50

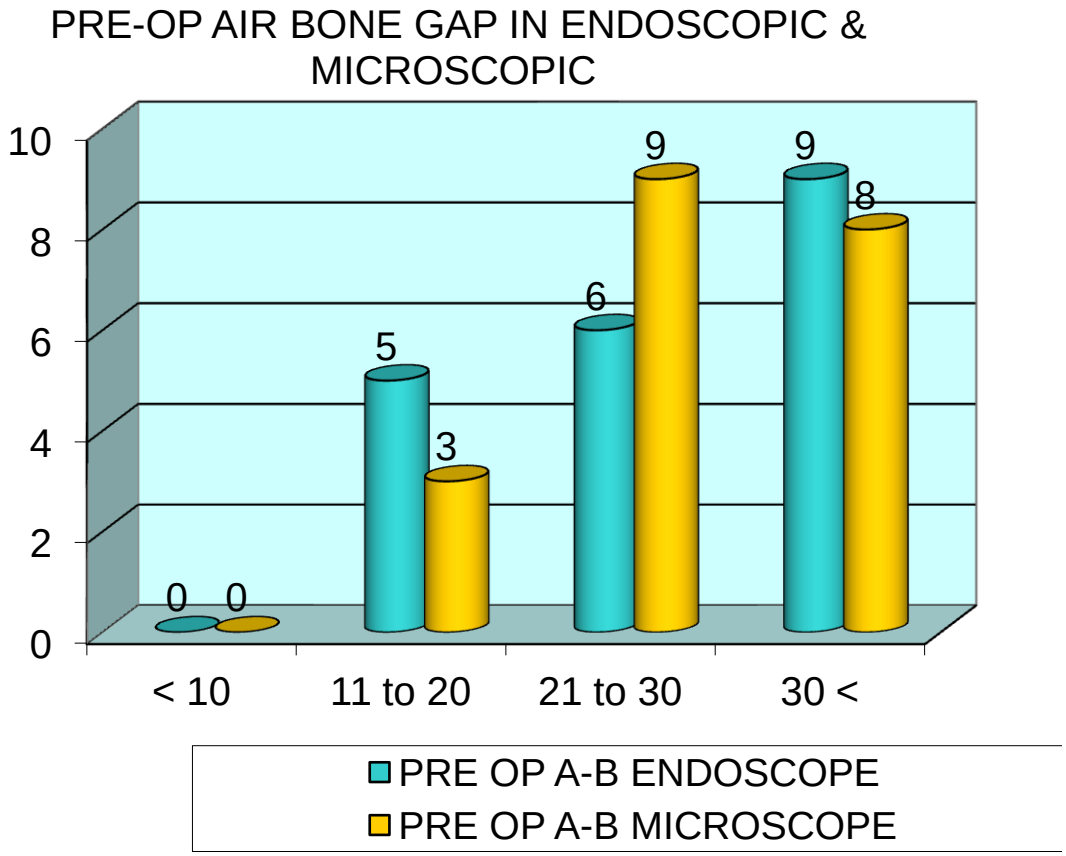


In this study this table no.7 and chart result shows that 85% graft uptake in endoscopic group and 80% in microscopic group. Student's t- test(P value 0.915) shows there is no significant difference in graft uptake in both group.

Table-8

Average preoperative Air – bone gap in pure tone audiometry in endoscopic and microscopic method

AIR BONE GAP	PRE OP A-B ENDOSCOPE	PRE OP A-B MICROSCOPE
< 10	0	0
11 to 20	5	3
21 to 30	6	9
>30	9	8
TOTAL	20	20



This table no.8 and chart shows the preoperative air bone gap in the pure tone audiometry in endoscopic group and microscopic group. In both group no patient have air bone gap <10 db. In endoscopic group, 5 cases were hearing loss in the range of 11-20 db. 6 cases were hearing loss in the range of 21-30 db. 9 cases have more than 30 db loss. In microscopic group ,3 cases have hearing loss in range of 11-20 db, 9 cases have 21-30 db loss, 8 cases have > 30 db loss.

The pre operative air bone gap distribution between the two group are more or less similar. Out of 40 patient 17 patient have hearing loss in the range of > 30 db hearing loss (30-40 db).

TABLE 9: GRAFT UPTAKE IN RELATION TO DISEASE IN CONTRALATERAL EAR

Disease	No.of Cases	No.of Graft up take	Percentage
B/L	11	6	54.55
U/L	29	27	93.10
TOTAL	40	33	82.50

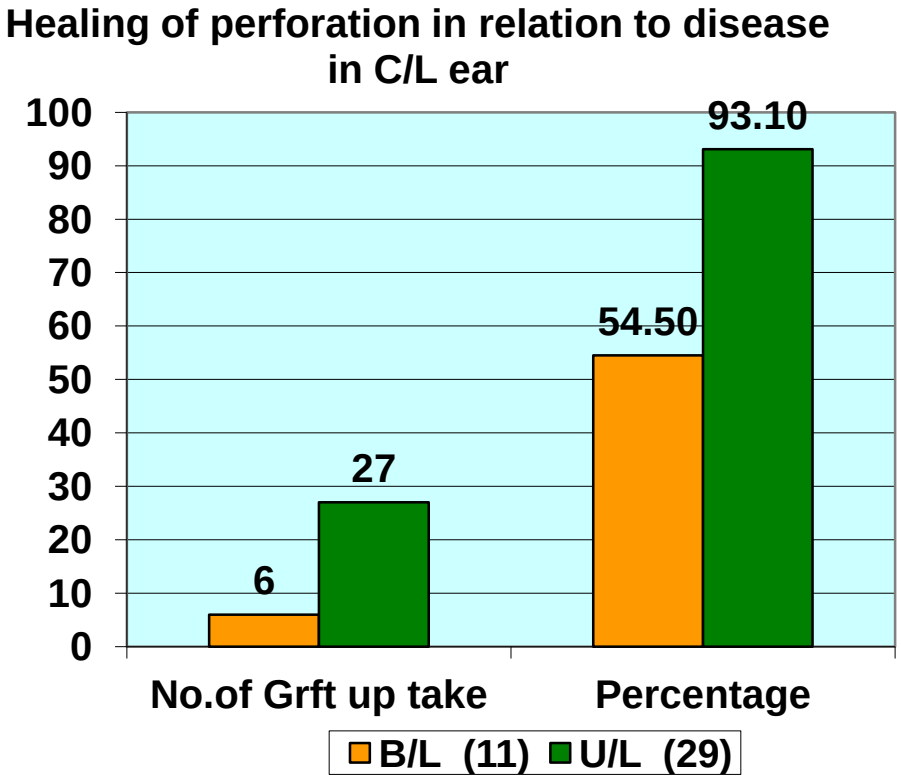
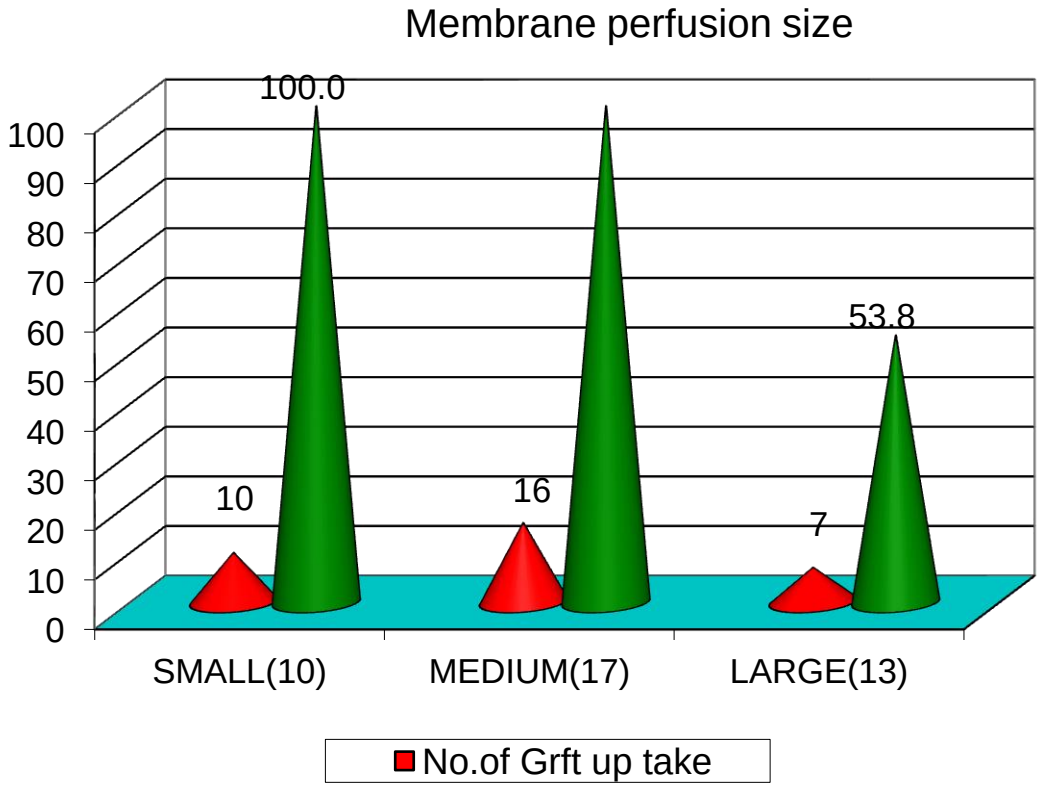


Table 9 and chart shows 11 cases present with bilateral ear disease. From 11 cases, only 6 cases (54%) had successful graft uptake. 29 cases present with unilateral CSOM, 27 cases (93%) show graft uptake.

TABLE 10: GRAFT UPTAKE IN RELATION TO SIZE OF PERFORATION:

Perfusion size	No.of Cases	No.of Graft up take	Percentage
SMALL(10)	10	10	100.00
MEDIUM(17)	17	16	94.12
LARGE(13)	13	7	53.85
TOTAL	40	34	85.00

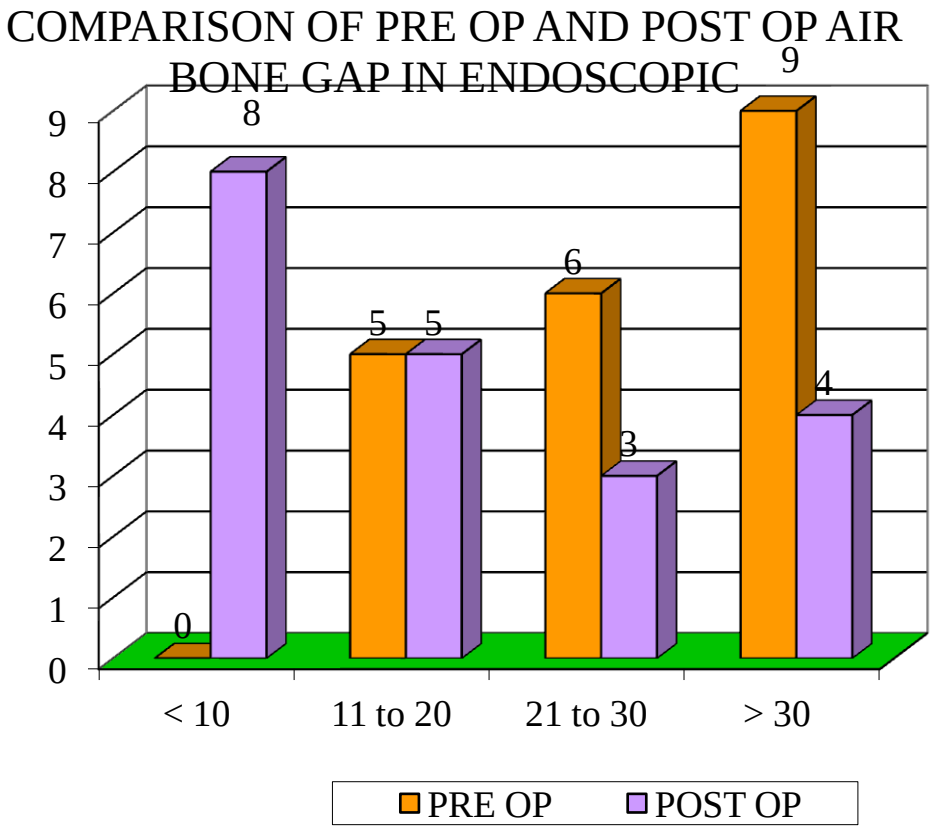


In this study out of 40 patients, this table no.10 and chart shows 10 cases have small perforation, graft uptake seen in all cases. 17 cases were medium perforation, graft uptake seen in 16 patients (94.12%). Reduced

graft uptake seen in large perforation, out of 13 cases only 7 cases (53.8%) show graft uptake.

TABLE 11: PREOPERATIVE AND POSTOPERATIVE AIR BONE GAP IN ENDOSCOPIC GROUP:

ENDOSCOPIC METHOD	PRE OP AIR-BONE GAP	POST OP AIR-BONE GAP
< 10	0	8
11 to 20	5	5
21 to 30	6	3
> 30	9	4
TOTAL	20	20



This table no.11 and chart shows, Out of 20 patients in endoscopic group, pure tone audiogram was used to assess the hearing improvement. None of cases below 10 db seen before surgery, post operatively 8 patient were improved hearing, A-B GAP <10db. 5 cases were in range of 11-20 db. 3 cases were in range of 21-30 db. 4 cases less improved hearing >30 db.

TABLE 12: PREOPERATIVE AND POSTOPERATIVE AIR BONE GAP IN MICROSCOPIC GROUP

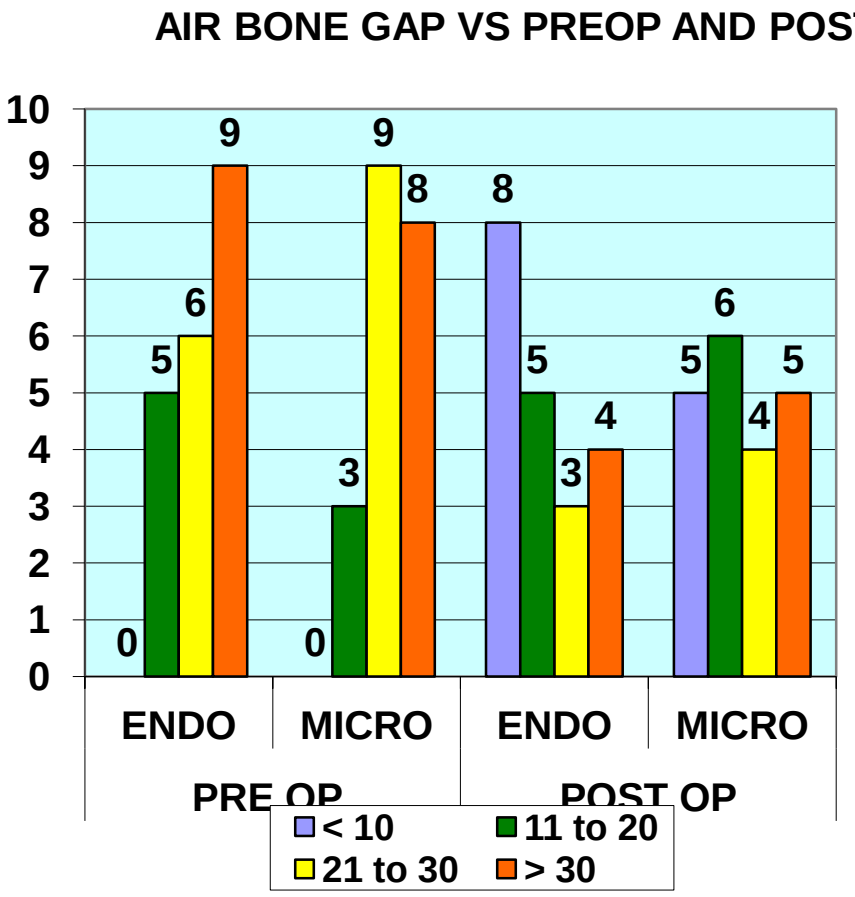
MICROSCOPIC.	PRE OP	POST OP
< 10	0	5
11 to 20	3	6
21 to 30	9	4
> 30	8	5
TOTAL	20	20

This table no.12 and chart shows, Out of 20 patients in Microscopic group, pure tone audiogram was used to assess the hearing improvement.

None of cases below 10 db seen before surgery, post operatively 5 patient were improved hearing, A-B GAP <10db. 6 cases were in range of 11-20 db. 4 cases were i n range of 21-30 db. 5 cases less improved hearing >30 db.

TABLE 13: COMPARISION OF PREOP AND POSTOP AIR BONE GAP IN MICROSCOPIC AND ENDOSCOPIC GROUP

AIR BONE GAP	PRE OP		POST OP	
	ENDO	MICRO	ENDO	MICRO
< 10	0	0	8	5
11 to 20	5	3	5	6
21 to 30	6	9	3	4
> 30	9	8	4	5
TOTAL	20	20	20	20



In this study, this table no. 13 and chart shows in Endoscopic group, the mean value of post op air bone gap was 19.7, standard deviation was 11.46. In microscopic group, mean value of post op air bone gap was 21.9, standard deviation was 10.73

P value was 0.535 (Insignificant). There is no significance between the improvements of post op air bone gap in two groups.

TABLE 14: COMPARISION OF AIR BONE GAIN IN MICROSCOPIC AND ENDOSCOPIC GROUP

AIR BONE GAP – GAIN	GAIN	
	ENDO	MICRO
< 10	8	11
11 to 20	8	6
21 to 30	1	0
> 30	0	0

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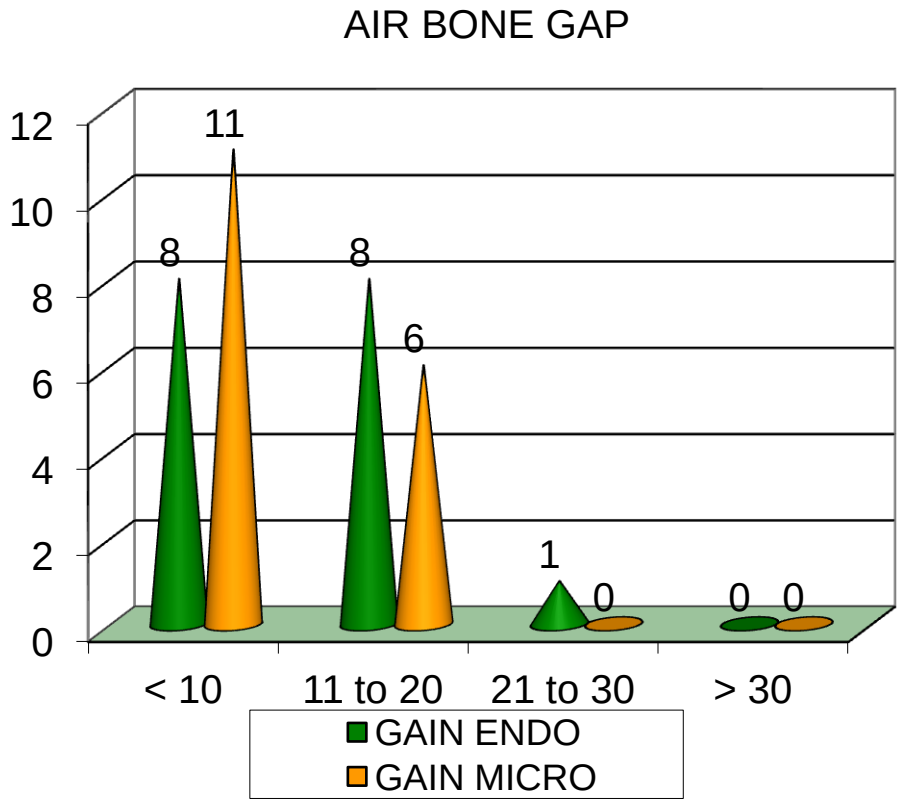

In this study, this table no. 15 and chart shows Endoscopic group, 8 cases show improved hearing <10 db. 8 cases have A-B gain in the range of 11-

20 db. 1 cases show improvement of 24 db. The mean value of air bone gap gain was 9.75. Standard deviation was 7.76

Microscopic group, 11 cases show improved hearing <10 db. 6 cases have improved hearing in the range of 11-20 db. None of patient in microscope has improvement in > 20 db. The mean value of air bone gap gain was 8.40, standard deviation was 4.86. P value of air bone gap gain between the two patients was 0.514. (NON SIGNIFISANT)

TABLE 15.COMPARSION OF SURGICAL APPROACH BETWEEN ENDOSCOPIC AND MICROSCOPIC METHOD

	Transcanal approach without canaloplasty (no.of pt)	Transcanal approach with canaloplasty (no.of pt)	postauricular approach without canaloplasty (no.of pt)	postauricular approach with canaloplasty (no.of pt)
Endoscopic group	20	-	-	-
Microscopic group	10	3	6	1

This table shows the surgical approaches and correlating procedure between the endoscopic and microscopic method. Patient in microscopic method 7 patient needed postauricular approach due to tortuous and narrow external auditory canal. 4 patients needed canaloplasty due to narrow bony external auditory canal. In the endoscope group, no patient needed canaloplasty or postauricular approach.

POST-OPERATIVE OPERATIVE STAY IN HOSPITAL ENDOSCOPIC AND MICROSCOPIC METHOD.

All Endoscopic group, myringoplasty done through transcanal approach, Patient discharged on the following day of surgery. In microscopic group, out of 20 patients, 7 patient needed postauricular approach, these patient discharged on 7th postoperative day after suture removal. All other patient discharged on the following day.

DISCUSSION

In this present study, endoscopic assisted myringoplasty and microscopic assisted myringoplasty techniques were compared. In this study conducted on 40 patients, who had tubotympanic chronic suppuarative otitis media with dry perforation with other evidence of any other pathology. The similar sample of patient selected in Anoop Raj, Ravi Meher, endoscopic Trans canal myringoplasty study. The 40 patient divided into two equal groups. 20 patients selected for microscopic myringoplasty and 20 patient selected for endoscopic myringoplasty method. Patients are randomly selected.

Patients were in age group of 15- 60 years selected. In the present study out of 40 cases, 14 cases in the age group of 15-29 years, 19 patients were 30-44 years, 7 cases were 45-60 years. These age groups are selected because there is reduced chance of upper respiratory tract infection.

0ut of 40 cases in these study 23 cases (57.5%) were female and 17 cases (42.5%) were male.

Patient who had selected for this study, one month period of dry ear was ensured prior to surgery, as it is generally believed that wet ear has direct bearing on the graft uptake rate. All patients underwent

myringoplasty by underlay technique. Similar technique adopted in many studies done previously.

In this study aimed to assess the efficacy of technique in the repair of tympanic membrane between endoscopic method and microscopic method, advantage and disadvantage of endoscopic method and microscopic method, to compare the preoperative air bone gap and postoperative air bone gap, assessment of graft uptake at the end of 6 month, considering the time taken by the gel foam to reabsorbed and complete epithelization.

Results of the surgery in myringoplasty are usually expressed in term of hearing improvement and graft uptake rate. In this study of 40 patients, 20 patients undergo endoscopic myringoplasty, in the 20 patients, 17(85%) patients had a successfully repaired tympanic membrane. Other 20 patients undergo microscopic myringoplasty, 16(80%) patients had a successfully repaired tympanic membrane. Total of 40 patients 33 (82.5%) had a successful graft uptake. The similar results are described in earlier studies.

A.S.Harugop conducted a comparative study between endoscopic method of myringoplasty and microscopic method of myringoplasty in 2008, 82% of cases had graft uptake in endoscope group and 86% of cases had graft uptake in microscope group.

Yadav SPS , Aggarwal N, In 2009 , did 50 cases of endoscopic assisted myringoplasty , they reported 80% graft uptake. In 2001 Anoop raj , ravi meher did 40 cases , 20 cases by microscopic method and so cases by endoscopic method, they reported 90% graft uptake in endoscopic method and 85% graft uptake in microscope method. Ahmed EI-Guindy evaluated the use of Hopkins's rod endoscope in dry tympanic membrane central perforation in 36 cases; the graft uptake was 91.7%.

Hearing improvements are similar in both groups. Also A-B gap gain in patients was calculated in both groups, in endoscopic method the mean gain was 9.75 dB, compare with microscopic method it was 8.40 dB. In endoscopic group, A-B gap checked postoperatively was found < l0dB in 8 cases and 5cases in microscopic group. Student t test was used to finding out significance in A-B gap gain in between the two groups and it was found that no significant difference in the gains of A-B gap between both group.

Adkin and white proposed that the two factors which adversely affect the success rate are, presence of near total or total perforation, presence of bilateral perforation. In this present study also this fact was observed, out of 40 patients, 10 cases were small perforation, 17 cases have medium perforation. Small and medium perforation had successful graft uptake. Large perforations were 13 cases, but only 7(53%) cases had

graft uptake. Out of 11 cases in bilateral perforation only 6 cases (54%) had graft uptake. unilateral ear disease patient had 93% graft uptake.

All patients in endoscopic group myringoplasty done through transcanal approach. Graft harvested by only 2 cm incision made in the hair but in the micro- scope myringoplasty method requires post aural William wilde incision (5cm long) in 7 cases out of 20 cases and also canaloplasty needed in 4 cases due to tortuous external auditory meatus, overhanging bony wall etc to obstruct the visualization of the whole membrane or difficult to visualize the anterior perforation when visualized through the micro- scope. Post aural approach or canaloplasty not needed in endoscopic procedure , it brings the operating field closer by moving the scope closure to the operating field, so operating time is reduced ,less bleeding , minimal invasion normal tissue, post operatively pain was reduced and no scar. Asymmetry of pinna and displacement of auricle was not occurring. Cosmetically better result.

In micro- scope technique, frequent manipulation of head of the microscope needed to see the whole parts of tympanic membrane due to external auditory canal Variations. Even with this frequent movement, full structure of the tympanic membrane not seen in tortuous canal, anterior bony overhang or stenotic bony canal, in that case, canaloplasty needed. Canaloplasty extent the sufgical procedure time. In using

endoscope, we able to move the tip of the endo scope closely to the operating field even in stenotic external auditory meatus, so frequent movement of patient head was not needed in endoscopic method.

We found that the graft positioning was faster and much easier while using the endoscope as it provide a wide angled view like whole tympanic membrane with annulus , the graft and medial end of external auditory canal. Unlike the microscope, the endoscope is easily trans-portable and hence is ideal for use in remote places to conduct the ear surgery camps.

Hopkins first developed the rod lens endoscope. He used thick rod- shaped glass lenses and small air spaces. The rod lens provides a wide angle view, more resolution and brightness.

The disadvantage of Endoscopic surgical procedure was a one handed technique. The Surgeon have to held the scope in left hand, so only the right hand was free to do surgery. In case of excessive bleeding, controlled with one hand was difficult .In microscope both hands are free , so easily managed the more bleeding by one hand can be used to suck the blood and the other hand can be used to do surgery . The same disadvantage was reported in earlier studies like Tarabichi and Karhuketo TS. But this disadvantage of the endoscope was overcome by using a stand for the scope, which fix the scope in proper position.

Bleeding will obstruct the operating field by soiling the scope is another disadvantage of the endoscope. So bloodless field is must for endoscopic ear surgery. Operating by directly visualizing through the endoscope produced neck strain and backache, It was more difficult to operate directly, so we use monitor and camera at all times, camera increased the weight of the scope, thereby producing left arm fatigue, but this disadvantage of the endoscope also was overcome by using a stand for the scope.

The main disadvantage of endoscope was monocular vision, loss of depth perception compared to the micro scope which provides the binocular vision. Therefore while doing with endoscope myringoplasty more careful to ensure that the graft had been tucked and lifted to make contact with the perforation edges. The difficulty is more in a beginner due to this loss of depth perception but it is easily managed with experience and practice.

Endoscopic ear surgery requires investment in endoscope, camera and monitor. But for a surgeon doing endoscopic sinus surgeries, there will be no added cost as the same scope can be used for ear surgeries as well.

Defogging agent like Savlon is routinely used in endoscoic surgical procedure for clear vision. Safety of the defogging agent (savlon) in the middle ear has not been established. To evaluate the absorption and the subsequent effect of savlon through the round window niche, more studies need to be done.

SUMMARY

CSOM is wide spread disease of the developing countries. Hence treating CSOM with surgical treatment by Tympanoplasty is one of the common procedure in ENT.

A comparative study between endoscopic assisted and microscopic assisted myringoplasty was done in 40 patient having dry central perforation with adequate cochlear reserve , 40 cases are equally divided into two group , 20 patient selected for endoscopic method and 20 patient selected for microscopic method. Females were 23 cases, males were 17 cases.

Preoperative audiogram revealed both group no patient have air bone gap <10 db, in endoscopic group, 11 cases were in the range of 11-30 db. 9 cases have more than 30 db loss. In microscopic group, 12 cases in range of 21-30 db loss, 8 cases have > 30 db loss.

At end of 6 month post op period endoscopic group, out of 20cases, 85% graft uptake. Microscopic group 80% graft uptake. There is no significant difference in graft uptake between two groups. Large size perforation has reduced uptake. Disease in contra lateral ear was found to affect the healing.

Post operatively, in Endoscopic myringoplasty, more than 10 db A-B gap gain was seen 11 cases, compare with microscopic group was seen in 13 cases. There was no significant difference between two groups.

Postauricular approach needed in 7 cases and canaloplasty needed in 4 cases in microscopic method.

CONCLUSION

In our study, graft uptake rate in endoscopic assisted myringoplasty was compared with the graft uptake rate in microscopic assisted myringoplasty. The result are similar ,but in terms of minimal invasive surgery, proximity vision provided , possibility of an all round vision just by rotating the angled scope, visualize of the deep recess and hidden areas of middle ear in single operating field, postoperative recovery , less operative time, Endoscopic method produced superior results and overcomes the disadvantage of microscope. Loss of depth perception and one handed technique are few disadvantages of endoscope, but it overcome with practice. Endoscope offers greater technical advantage in myringoplasty and it increases the transcanal procedure over the postauricular approach.

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PROFORMA

Name : Age & Sex :

Address : Ipno:

Does the patient have hard of hearing : Yes/ No

If yes mention side and duration : Right /Left /both ….

Does the patient have Ear discharge : Yes/ No

If yes mention side and duration : Right /Left /both ….

Does the patient have Ear pain : Yes/ No

If yes mention side and duration : Right /Left /both ….

Does the patient have Trauma : Yes /No

Does the patient have Headache : Yes /No

Does the patient have Tinnitus : Yes /No

Does the patient have Vertigo : Yes /No

Does the patient have Vomiting : Yes /No

Does the patient have any diabetes ,

hypertension,asthma,epilepsy, : Yes/No

Does the patient have any previous surgery : Yes/No

Examination of Ear /Otoscopy

	Right	Left
Pinna		
Pre/post auricular Area		
EAC		
Tympanic membrane		
Facial nerve		

Sno	Name	Age	sex/ ipno	Size of perforation	U/l or B/l	Pre op air - bone gap	Post op air bone gap	Air-bone gap gain	Graft uptake	method
1	Sathya	24	F/1071	medium perforation	u/l	30 db	< 10 db	20db	Yes	Endoscope
2	Muthu kumar	32	M/12938	medium perforation	u/l ,	23 db	< 10 db	13db	yes	Endoscope
3	mosis	47	M/73159	Large perforation	b/l	40 db	40 db	odb	no	Endoscope
4	gurubakiyam	32	F/29183	medium perforation	u/l	48 db	20 db	28 db	yes	Endoscope
5	jitender singh	37	M6740	small perforation	u/l	13 db	<10 db	5db	yes	endoscope
6	sagunthala	27	F/89749	medium perforation	b/l	20 db	<10 db	10db	yes	Endoscope
7	Therasa	26	F/11167	small perforation	u/l	12 db	< 10 db	5db	yes	Endoscope
8	Nandhini	16	F/37339	medium perforation	u/l	18 db	12 db	6db	yes	Endoscope
9	shanthi	30	F/13981	Large perforation	b/l	36 db	24 db	12db	yes	Endoscope
10	shanmugavalli	35	F/13309	medium perforation	u/l	26 db	16 db	10db	yes	Endoscope
11	jayalakshmi	33	F/13839	medium perforation	b/l	25 db	<10 db	15 db	yes	Endoscope
12	Rageswari	24	F/14678	small perforation	u/l	30 db	18 db	12db	yes	Endoscope
13	kavitha	32	F/40602	Large perforation	b/l	33 db	23 db	10db	yes	Endoscope
14	Backiyam	30	F/21765	small perforation	u/l	21 db	<10 db	11db	yes	endoscope
15	alagu raja	26	M/39801	small perforation	u/l	12 db	<1o db	8db	yes	Endoscope
16	jayaraj	55	M/15795	Large perforation	u/l	50 db	30 db	20db	yes	Endoscope
17	krishnavani	46	F/80221	Large perforation	u/l	36 db	32 db	4 db	yes	Endoscope
18	nagappan	35	M/38308	Large perforation	b/l	40 db	40 db	o db	no	Endoscope
19	Dharmaraj	45	M/42842	medium perforation	u/l	33 db	16 db	17 db	yes	Endoscope
20	nallapillai	43	M/39659	Large perforation	u/l	43 db	43 db	o db	no	Endoscope
21	sasikala	34	F/42136	medium perforation	u/l	26 db	16 db	10 db	yes	microscope
22	pazhani	38	M/22168	Large perforation	b/l	42 db	42 db	o db	no	microscope
23	savithiri	22	F/22493	medium perforation	u/l	28 db	17 db	11 db	Yes	microscope
24	kumarasamy	35	M/24500	medium perforation	b/l	32 db	25 db	7 db	yes	microscope
25	pandi	24	M/26369	small perforation	u/l	20 db	<10 db	15 db	yes	microscope
26	sethulakshmi	18	F/26803	medium perforation	u/l	30 db	32 db	2 db	no	microscope
27	veeramal	40	F/27772	medium perforation	b/l	36 db	24 db	12 db	yes	microscope
28	fathima	33	F/29173	Large perforation	u/l	40 db	27 db	13 db	yes	microscope
29	priya	20	F/29525	medium perforation	u/l	26 db	<1o db	16 db	yes	microscope
30	mariappan	48	M/29555	Large perforation	u/l	40 db	36 db	4 db	yes	microscope
31	vadivel murugan	22	M/26783	small perforation	u/l	16 db	<10 db	8 db	yes	microscope
32	kalaiselvi	25	F/29754	small perforation	u/l	2o db	<1o db	12 db	yes	microscope
33	parvathy	46	F/30935	Large perforation	b/l	36 db	29 db	7 db	yes	microscope
34	muthulakshmi	34	F/30934	Large perforation	b/l	40 db	40 db	0 db	no	microscope
35	pandiselvi	22	F/46732	medium perforation	u/l	26 db	16 db	10 db	yes	microscope

36	kanagaraj	29	M/34578	medium perforation	u/l	30 db	2o db	10 db	Yes	microscope
37	pitchai	47	M/42367	Large perforation	u/l	38 db	25 db	13 db	yes	microscope
38	sumathi	33	F/36940	small perforation	u/l	20 db	<10 db	12 db	yes	microscope
39	mohanraj	30	M/33999	medium perforation	u/l	30 db	20 db	10 db	yes	microscope
40	karthick	31	M/33157	small perforation	u/l	26 db	12 db	14 db	yes	microscope

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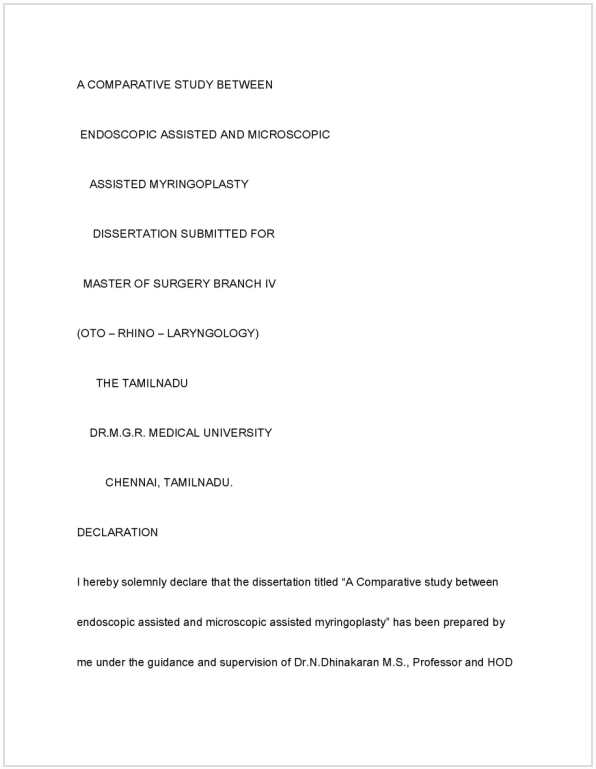

A COMPARATIVE STUDY BETWEEN

ENDOSCOPIC ASSISTED AND MICROSCOPIC

ASSISTED MYRINGOPLASTY

DISSERTATION SUBMITTED FOR

MASTER OF SURGERY BRANCH IV

(OTO – RHINO – LARYNGOLOGY)

THE TAMILNADU

DR.M.G.R. MEDICAL UNIVERSITY

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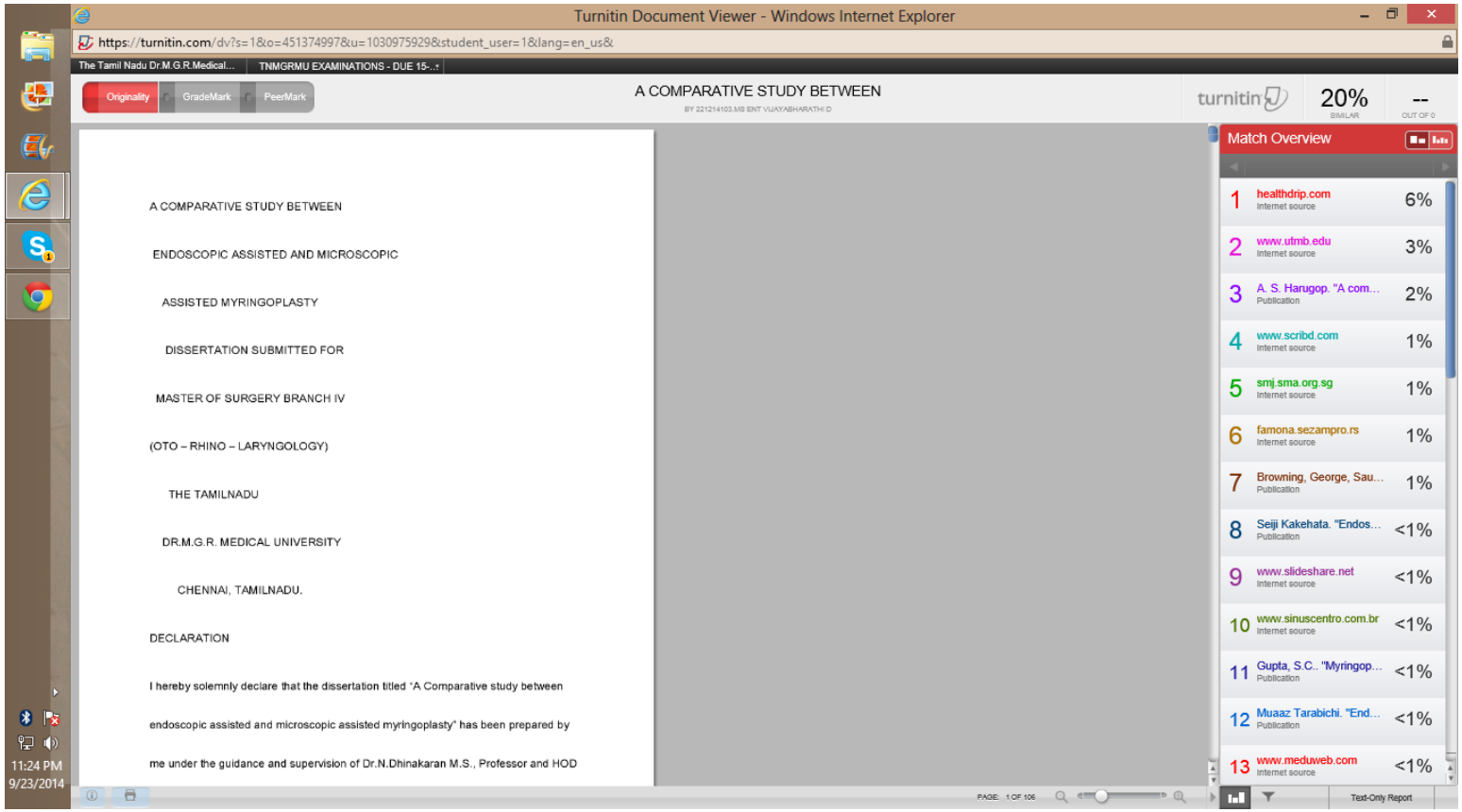
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