

DISSERTATION ON
“A COMPREHENSIVE STUDY ON CARTILAGE
TYMPANOPLASTY IN ADHESIVE OTITIS MEDIA”

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CERTIFICATE

This is to certify that this dissertation “**A COMPREHENSIVE STUDY ON CARTILAGE TYMPANOPLASTY IN ADHESIVE OTITIS MEDIA**” submitted by **Dr.SARAVANA SELVAN .V**, appearing for M.S ENT Branch IV Degree examination in April 2013 is a bonafide record of work done by him under my direct guidance and supervision in partial fulfillment of the regulations of the Tamilnadu Dr.M.G.R Medical University, Chennai forward this to the Tamilnadu Dr.M.G.R Medical University, Chennai,Tamilnadu, India.

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ABBREVIATIONS

TM	:	Tympanic membrane.
ABG	:	Air bone gap
EAC	:	External auditory canal
dB	:	Deci Bel
MERI	:	Middle ear risk index
PTA	:	pure tone audiogram
M	:	Malleus
I	:	Incus
S	:	Stapes
KHz	:	kiloHertz
AC	:	Air conduction
BC	:	Bone conduction

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A COMPREHENSIVE STUDY ON CARTILAGE TYMPANOPLASTY IN ADHESIVE OTITIS MEDIA

ABSTRACT

Objective: The surgical management of adhesive otitis media is debatable. Adhesive otitis media progressing to cholesteatoma cannot be predicted, and hearing remains normal until later in the disease course. Hence surgery is done only when there is an hearing loss or frank cholesteatoma develops, where an extensive surgery may be needed. Earlier intervention is often avoided due to near normal hearing levels at this stage in some cases. Hearing results who have undergone cartilage tympanoplasty with or without ossicular reconstruction are reported for patients with adhesive otitis media.

Study design: This is a prospective study.

Setting: Study was done at Madras Medical College and Rajiv Gandhi Govt General Hospital, Chennai-3.

Patients: A total of 30 patients (31 ears) aged 13-48 years underwent cartilage tympanoplasty with or without ossicular reconstruction.

Interventions: Tympanotomy followed by cartilage reconstruction of the tympanic membrane, with ossicular reconstruction if there is any ossicular discontinuity.

Main Outcome Measure(s): Post-operative pure tone average, air-bone gap for 3 frequencies (500, 1000, 2000 Hz) compared to pre-operative levels.

Results: There was a statistically significant improvement in hearing.

Conclusions: cartilage tympanoplasty with or without ossiculoplasty is effective for adhesive otitis media.

INTRODUCTION

The management of the atelectatic ear continues to be one of the most controversial issues facing the otolaryngologist. Much of the confusion associated with this disorder stems from a poor understanding of the underlying pathophysiologic conditions that ultimately lead to changes in the tympanic membrane, resulting in atrophy, diffuse or local retractions, and cholesteatoma formation. Likewise, the lack of an accepted classification or grading scheme for the atelectatic ear has made it difficult to elucidate and predict the natural history of this disease and effectively predict those cases that will ultimately develop complications, such as cholesteatoma. The controversy is augmented by the fact that, early in the course of the disease, and even in the presence of incus erosion, hearing loss is frequently minimal and the patient, for the most part, asymptomatic (1).

The otologist thus faces a dilemma. Should a procedure such as cartilage tympanoplasty be performed early in the disease when the hearing is often normal as a prophylactic measure, or later in the disease after the development of hearing

loss or frank cholesteatoma? With early intervention, before the development of cholesteatoma, the structural abnormalities in the ear drum and middle ear space are technically easier to correct, and adhesion formation is minimized. The main disadvantage lies in the possibility of performing an unnecessary surgery in an ear that potentially would have remained stable with time. Likewise, the possibility of making the hearing worse with early intervention in an otherwise functional ear must be taken into consideration. On the other hand, if the surgeon waits until the eardrum retraction has turned into cholesteatoma or significant hearing loss has occurred, there is no question of surgical necessity. However, with this approach, the patient is put at increased risk for much more extensive, and often multiple, surgical interventions. Due to the incipient infection and mucosal disease associated with cholesteatoma, the ultimate hearing result may be suboptimal in these cases.

To resolve this dilemma, several issues must be addressed. First, if early surgical intervention is to be advocated, the effect on hearing must be analyzed. For this treatment modality to be a viable alternative, the surgical technique must provide a rigorous

and stable reconstruction of the tympanic membrane without a detrimental effect on hearing. Secondly, a classification scheme for *pars tensa* retractions must be used and validated in order to standardize results and ultimately develop a risk profile to determine which cases may be at high risk for the development of complications.

CRITICISMS OF CARTILAGE T-PLASTY

- ❖ Time consuming to shape cartilage
- ❖ Warping of cartilage
- ❖ Opaque - Difficulty in surveillance
- ❖ Rigidity of cartilage raises concern about audiologic outcome
- ❖ PROBLEMS/PITFALLS
- ❖ INTRA-OP
- ❖ Improper fit & Difficult placement
- ❖ POST-OP
- ❖ Persistent effusion with CHL
- ❖ Potentially hide residual disease
- ❖ Displacement
- ❖ Resorption

The purpose of this study was to analyze hearing results and complications in patients undergoing cartilage tympanoplasty with or without ossicular reconstruction for the treatment of adhesive otitis media.

AIMS AND OBJECTIVES

- ❖ A comprehensive study of cartilage perichondrium tympanoplasty in adhesive otitis media.
- ❖ To analyse the intactness of tympanic membrane and stability of tympanic membrane reconstructed by cartilage.
- ❖ To analyse the hearing results after the procedure.
- ❖ To find the commonest etiology of adhesive otitis media in my study group.

REVIEW OF LITERATURE

- ❖ Sade. J. Avraham S, and Brown. M, (1982) studied about dynamics of atelectasis and retraction pockets In : Cholesteatoma and Mastoid Surgery (Proceedings of the 11th International conference, edited by J.Sade Amsterdam : Kigler, pp 267 — 282.
- ❖ Sade. J and berco E, (1976) studied about Atelectasis and secretory otitis media (American journal of Otolaryngology).
- ❖ Takahashi et al 1995 observed that normal individual who is not otitis-prone sometimes has tubal dysfunction with an upper respiratory tract infection and needs several weeks to recover.
- ❖ Matsune et al 1996 showed that an important function of the Eustachian tube, the protection of the middle ear is mainly carried out by morphological features such as submucosal lymphoid follicles.
- ❖ Okubo 1993, reported that advocating the idea that gases are always produced in the middle ear (mastoid) and

expelled through the Eustachian tube : in other words, that both ventilation and clearance are directed from the middle ear to the nasopharynx.

- ❖ Yu ES, QiZM, the article on operative therapy of the adhesive otitis media showed that adhesive otitis media can be treated with cartilage tympanoplasty. The cartilage was a good material for reconstruction of the ear drum to the treatment of it.
- ❖ Sade et al 1982, showed that the ventilating tube insertion is the commonest surgical procedure performed. This can arrest further progression in about 60% of grade 1 retraction pockets of pars tensa.
- ❖ Srinivasan et al 2000 showed that the retraction is deemed amenable for complete excision, and it is their experience to perform this procedure in both ears at the same time as a day care procedure I both in children and adults. And success rate is around 65% in retraction of grade 1 to 3.
- ❖ Levinson 1987, charaction et al 1992, Yung 1997 showed that the cartilage is considered to provide good re

enforcement for the healing tympanic membrane. The reported recurrence rate of retraction with this procedure varies from 5% to 45%.

- ❖ Desarda KK, Bhisegaonkar DA, Gill S Tragal perichondrium and cartilage in reconstructive tympanoplasty, Indian Otolaryngol Head Neck Surg, 2005 ; 57 9- 12, In their study, they strongly recommend the tragal perichondrium and cartilage composite graft in various tympanoplasty reconstructions. The hearing improvement within 15 dB of bone conduction has become almost a standard criterion for the analysis of surgical success.

ANATOMY OF MIDDLE EAR CLEFT

The middle ear cleft has the tympanic cavity, the Eustachian tube and the mastoid air cell system. The tympanic cavity is lined with mucous membrane and filled with air. It contains three small bones the malleus, incus and stapes, called the auditory ossicles.

The tympanic membrane separates the tympanic cavity from the external acoustic meatus. It lies obliquely, at an angle of 55° with the meatal floor. Its peripheries are thickened to form fibrocartilaginous ring or annulus which is attached to the tympanic sulcus at the medial end of the meatus. This sulcus is deficient superiorly. The small triangular part of the membrane, the pars flaccida, lies above these folds and is lax and thin.

The ossicular chain made up of the malleus, incus and stapes serves to conduct sound from tympanic membrane to the cochlea.

The lateral process and handle of malleus are attached to the tympanic membrane. The body of the incus articulates with the head of the malleus in the epitympanum. The head of the stapes articulates with the lenticular process of incus and in turn its footplate sits in the oval window surrounded by the annular ligament.

MIDDLE EAR SPACES

The middle ear cavity can be spatially divided into hypotympanum, mesotympanum, and epitympanum .

The Epitympanum or the attic is above the malleolar folds. It is separated from the mesotympanum by mucosal membranes and the folds.

The mesotympanum is the space just medial to the tympanic membrane, which extends from the eustachian tube opening anteriorly to the facial nerve posteriorly. The carotid artery is located medial to the eustachian tube opening. The cochlear promontory forms the medial wall of the mesotympanum marked posteriorly by the oval window superiorly, which is occupied by the stapes, and the round window inferiorly. The pyramidal eminence transmits the stapedial tendon to the stapes Suprastructure. The inferior annulus of the tympanic membrane marks the inferior limit of the mesotympanum and superior limit of the hypotympanum.

The hypotympanum is limited inferiorly by the jugular bulb may extend inferomedial to the cochlea.

Embryologically middle ear is formed of Four types of sacs.they are

- 1) Saccus medius
- 2) Saccus anticus
- 3) Saccus superior
- 4) .Saccus posticus

SACCUS MEDIUS - forms the epitympanum.

SACCUS ANTICUS

It develops anterior portion of middle ear & is usually bounded superiorly by tensor tympani & fold .When the growth of the pouch of saccus medius is relatively slow saccus anticus forms the anterior epitympanum & tensor fold is incomplete in such cases epitympanum is divided vertically by Superior malleolar fold in to anterior & posterior compartments (anterior compartment directly communicates with protympanum & Eustachian tube ,Posterior compartment is ventilated via the tympanic isthumus & aditus and antrum)

SACCUS SUPERIOR

Grows between malleus handle and long crus of incus to form the inferior Incudal space which lies beneath the incus body. It goes on to pneumatize the squamous portion of temporal portion

SACCUS POSTICUS

Forms the posterior middle ear & hypotympanum. The facial recess, sinus tympani, round window, most of the oval window are derived from saccus posticus

TYMPANIC DIAPHRAGM

Term introduced by Politzer to define the obstacles within the tympanic isthmus & the attic. These obstacles are the tympanic folds and ligaments running between the surrounding bony structures and the incus body and malleus head. Only two narrow passages anterior & posterior tympanic isthmus breach this diaphragm. It is the common site for impairment of ventilation to the antrum. Wullstein defines this region as 2nd bottle neck of air flow, 1st bottle neck being within the eustachian tube

Anterior tympanic isthmus is larger, lies medial to the incus body and passes between tensor tympani tendon.

Posterior tympanic isthmus small and lies between medial incudal fold and posterior tympanic wall.

CLINICAL IMPORTANCE: It resists the spread of epitympanic cholesteatoma to mesotympanum & vice versa.

MUCOSAL FOLDS

- ❖ The ossicular chain, ligaments, tendons of tensor tympani & stapedius muscle and chord tympani nerve are called the **VISCERA** of the middle ear & mucosal folds are the **MESENTERIES**. The mucosal folds divide the attic into various compartments. They are located both in lateral attic and medial attic. Lateral incudal fold connects the lateral attic wall and the body of the incus. It extends posteriorly to the posterior incudal ligament. Superior incudal fold extends, like the superior incudal ligament, between the superior aspect of the incus body and the superior attic wall. Medial incudal fold is located between long process of mucus and tendon of stapedial muscle, as far as the pyramidal eminence

PRUSSAK 'S SPACE BOUNDARIES

- ❖ Laterally:shrapnells membrane
- ❖ Medially:neck of malleus
- ❖ Superiorly:lateral malleolar fold
- ❖ Inferiorly:lateral process of malleus.

PHYSIOLOGY OF HEARING

MIDDLE EAR TRANSFORMER MECHANISMS

The middle ear transfers the incoming vibration from the comparatively large low impedance, the tympanic membrane to the much smaller higher impedance, the oval window. When a sound wave meets a higher impedance medium, normally much of the sound energy is reflected. The middle ear apparatus, by acting as an acoustic impedance transformer, reduces this attenuation substantially. An efficient impedance transformer will change the low-pressure, high-displacement vibrations of the air into high-pressure, low-displacement vibrations suitable for driving the cochlear fluids. Two major components have been identified in the mechanism by which this happens.

A) OSSICULAR COUPLING

The middle ear is composed of tympanic membrane, the ossicles (malleus, incus, and stapes), and the stapedius and tensor tympani muscles. As a sound stimulus enters the external auditory canal, it causes the tympanic membrane to vibrate. The malleus, which is coupled to the tympanic

membrane, vibrates in response to the motion of the tympanic membrane. This causes the entire ossicular chain to vibrate, resulting in sound transmission to the inner ear via the stapes footplate. This pathway of sound transmission is referred to as ossicular coupling.

The ossicular chain has two synovial joints that are mobile: The incudomalleal and the incudostapedial joints. The ossicular chain vibrates along an axis that projects through the head of the malleus and the body of the incus in an anterior-to-posterior direction. The stapes, the smallest bone in the body, transmits the output of the middle ear into the inner ear through the oval window.

B) ACOUSTIC COUPLING

Because the inner ear is fluid-filled, if the sound stimulus strikes the inner ear fluid directly, most of the acoustic energy is deflected, as the impedance of fluid is much greater than the impedance of air.

The pathway of sound transmission to the inner ear in the absence of the ossicular system is referred to as acoustic coupling. It has been shown that the difference

between ossicular coupling and acoustic coupling is about 60 dB, which is the maximal amount of hearing loss expected in patients with ossicular discontinuity.

IMPEDANCE MATCHING

The major transformer mechanisms in middle ear include;

CATENARY LEVER - Attachment of the tympanic membrane at the annulus, amplifies the energy at malleus due to elastic properties of stretched drum head fibres. Since the annulus surrounding tympanic membrane is immobile, sound energy is directed from the edges of the drum towards the centre of the drum. The malleus receives the redirected sound energy and provides at least two fold increase in sound pressure at the malleus.

OSSICULAR LEVER- Lever ratio refers to the difference in length of the manubrium of the malleus and the long process of the incus.

Because the manubrium is slightly longer than the long process of the incus, a small force applied to the long arm of the lever (manubrium) results in a larger force on the

short arm of the lever (incus long process). the lever ratio is about 1.31 : 1 (2.3 dB).

HYDRAULIC LEVER - “Area ratio” between the tympanic membrane and the stapes footplate .The human tympanic membrane has a surface area approximately 20 times larger than the stapes footplate (69 vs 3.4 mm²). If all the force applied to the tympanic membrane were to be transferred to the stapes footplate, the force per unit area would be 20 times larger on the footplate than on the tympanic membrane.

The combined effects of the area ratio and the lever ratio give the middle ear output a 28-dB gain theoretically.

EUSTACHIAN TUBE FUNCTION AND THE MIDDLE EAR PHYSIOLOGICAL FUNCTION:

- 1) Pressure regulation
- 2) Protection of middle ear from pathogen/foreign body in nasopharynx
- 3) Clearance of middle ear space.

- 4) ventilation function.

ANATOMY

Length-31 to 38mm Bony-12mm Cartilaginous-24mm

MUSCLES OF ET

- 1) Tensor veli palatine: primary dilator of ET
- 2) Levator veli palatine
- 3) Salpingopharyngeus: Assist opening of ET with deglutition
- 4) Tensor Tympani

ETIOLOGY OF ETD

- 1) Viral URI
- 2) Chronic sinusitis
- 3) Allergic rhinitis
- 4) Adenoid hypertrophy
- 5) Tobacco smoke
- 6) Reflux
- 7) Cleft palate

- 8) Radiation
- 9) Reduced mastoid air cell system
- 10) Nitrous oxide

EVALUATION OF ET FUNCTION

- ❖ Valsalva testing
- ❖ Toynbee test
- ❖ Politzer test
- ❖ Sonotubometry
- ❖ Impedance audiometry

MEDICAL TREATMENT OF ET DYSFUNCTION

Nasal steroids, valsalva

SURGICAL TREATMENT

- ❖ Insertion of ventilation tube
- ❖ Mastoid obliteration for preventing recurrence
- ❖ Laser Eustachian tuboplasty

COMPLICATIONS OF EUSTACHIAN TUBE DYSFUNCTION

- ❖ Cholesteatoma
- ❖ Retraction
- ❖ Effusion & Atelectasis.

MIDDLE EAR ATELECTASIS

Atelectasis of the middle ear is a Retraction or collapse of the tympanic membrane because of otitis media, Eustachian tube dysfunction, or both is characteristic of the condition.

Collapse implies passivity (high negative middle ear pressure is absent) whereas retraction implies active pulling inward of the tympanic membrane, usually from negative middle ear pressure.

Finally, one considers whether the pocket is self cleansing and free of infection ie. Whether epithelial debris crusting or purulent material present within the pocket. middle ear effusion is usually absent in atelectatic ear.

PATHOGENESIS

Factors regulating middle ear pressure are

- 1) Gas diffusion through the middle ear mucosa
- 2) Pressure buffer of the mastoid air cell system
- 3) Gas exchange through Eustachian tube

MUCOSAL RESPIRATION

- 1) Middle ear mucosa exchanges gas similar to alveoli
- 2) More inflamed the mucosa, greater the rate of gas absorption
- 3) Most of the gas exchanges occur around the antrum

MASTOID VOLUME AND PRESSURE

Anatomic volume of aerated middle ear space affects how the drum behaves amount of mastoid aeration is important in regulating middle ear pressure. mastoids are physiological buffers. in chronic ear syndrome mastoids are sclerosed.

EUSTACHIAN TUBE FUNCTION

Volume of gas exchange is around 1microlitre with every swallow in non-diseased states

TYMPANIC MEMBRANE

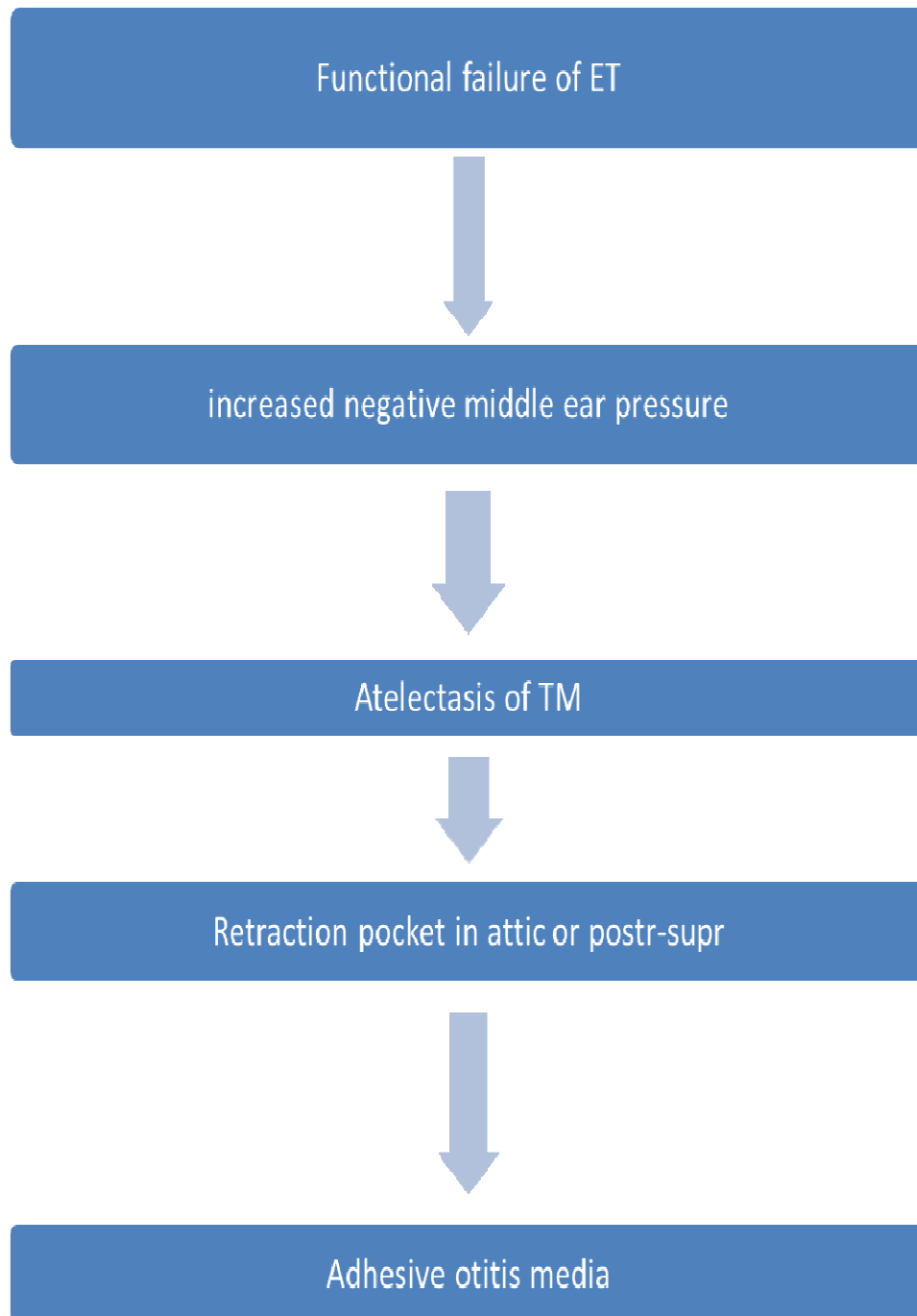
Posterior portion of pars tensa has thinner lamina propria and increased vascular supply, this makes it more vulnerable in inflammatory process.

Pars flaccida retraction are more common than pars tensa

ADHESIVE OTITIS MEDIA

Adhesive otitis media is a result of healing following chronic inflammation of the middle ear and mastoid. The mucous membrane is thickened by proliferation of fibrous tissue, which frequently impairs movement of the ossicles, resulting in conductive hearing loss.

PATHOGENESIS OF ADHESIVE OTITIS MEDIA



CONDUCTIVE DEAFNESS IN TYMPANIC MEMBRANE ATELECTASIS

Atelectasis of the tympanic membrane can result in conductive hearing losses that vary in severity from negligible to 50 dB.

The conductive deafness can be explained on the basis of a reduction in ossicular coupling.

As long as the area outside round window remains aerated and is shielded from the sound pressure in the ear canal by the TM the conductive loss caused by the atelectasis should not exceed the amount of middle ear pressure gain in normal ears i.e. air bone gap up to 25 dB. If atelectasis results in invagination into the round window niche the protective effect of TM and middle ear space and round window niche is lost and larger air bone gap (40 - 50 dB) should result.

MATERIALS AND METHODS

STAGING SYSTEM AND INTERVENTIONS SADE CLASSIFICATION

- ❖ Grade 1: Mild retraction
- ❖ Grade 2: TM in contact with incus
- ❖ Grade 3: TM in contact with promontory but mobile (atelectasis)
- ❖ Grade 4: TM adherent to promontory and not mobile (Adhesive otitis media)

The classification for *pars tensa* retractions used by **John Dornhoffer** includes 4 types and is a slight modification of that described by Sade. A type I retraction involves a mild retraction of the tympanic membrane, as is often seen in mild Eustachian tube dysfunction or resolving serous otitis media. A type II retraction describes tympanic membrane retraction to the incus or stapes, the so-called myringo-incudo-stapediopexy. The type III retraction is an extension of the type II retraction, but with involvement down to the promontory. A type IV retraction is a continuation of the type III, but the full extent or depth of the retraction cannot be adequately visualized by micro-otoscopy. The presence or absence of adhesions is noted separately for

each type. If significant keratin debris accumulation is observed in a *pars tensa* retraction, it is considered a mesotympanic cholesteatoma as opposed to a type IV retraction.

At our institution, global treatment of the underlying Eustachian tube dysfunction is the primary intervention for the atelectatic ear and is carried out before any consideration is given to surgical intervention. Allergy is considered and treated appropriately in every case. Sinonasal disease is corrected prior to surgical intervention and adenoidectomy is considered in children when indicated. Valsalva is performed at least three times a day. Generally speaking, type I retractions respond to medical management. If the retraction worsens or is associated with a significant conductive hearing loss, a ventilation tube is considered. A type II retraction is treated in much the same way. If the patient is able to perform the Valsalva maneuver and the conductive hearing loss is minimal, close observation via clinic follow-up is instituted. It is our experience that most of these ears remain stable. If the Valsalva maneuver can not be performed adequately, the patient is treated with nasal steroid sprays, encouraged to continue attempts at Valsalva, and followed closely at 2- to 3-month intervals. A

ventilation tube is warranted if the retraction worsens or conductive hearing loss occurs. While medical management frequently suffices for the first three types of retractions, it is proved that type 4 retraction represents an unpredictable and potentially dangerous situation. The development of adhesions in an atelectatic eardrum is often the first step in cholesteatoma formation and is felt to be associated with a poor prognosis due to loss of mucosal integrity (3). With the type 4 retraction, the tympanic membrane now makes significant contact with the promontory, with significant adhesion formation . The real predicament is that it is frequently difficult, even with pneumatic otoscopy, to determine the presence of adhesions by clinical examination. Surgical intervention with cartilage tympanoplasty is therefore considered in the type 4 retraction when adhesions are demonstrated clinically or when they cannot be ruled out with pneumatic otoscopy. In addition to the fact that, because the depths of the retraction cannot be visualized, cholesteatoma formation cannot be adequately ruled out. For purposes of our study, we have confined our results to patients with type IV retractions undergoing surgical intervention.

SURGICAL TECHNIQUE

The atelectatic eardrum is carefully elevated off the promontory and middle ear structures, without violating the mucosa if possible. Redundant tympanic membrane is removed, and the ossicular chain is inspected. If good movement exists between the incus and stapes we proceed with cartilage tympanoplasty. The incus is removed if the lenticular process shows erosion, a cartilage-perichondrium island flap technique or a cartilage shield technique is used to reconstruct tympanic membrane using cartilage harvested from the tragal area/cymba/concha,

A cartilage-perichondrium island flap technique- After removing perichondrium from one side, the cartilage is carved to create a 7- to 9-mm eccentrically located disc of cartilage with a flap of perichondrium located posteriorly. A complete strip of cartilage 2-3 mm in width is removed vertically from the center of the cartilage in order to accommodate the entire malleus handle. The creation of two cartilage islands in this manner is essential to enable the reconstructed tympanic membrane to bend and conform to its normal conical shape. The entire graft is

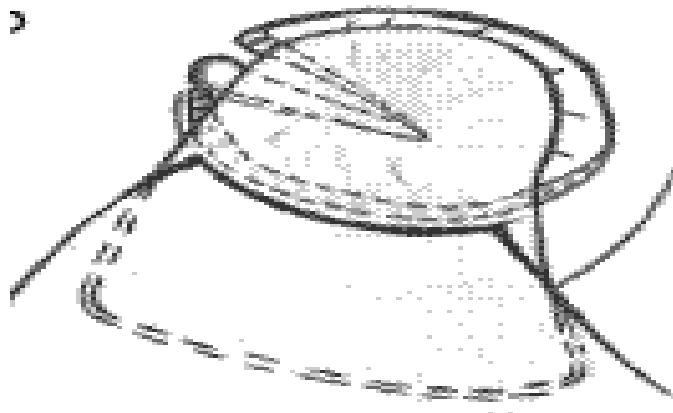
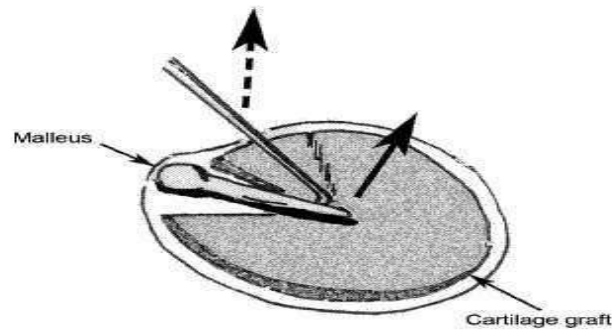
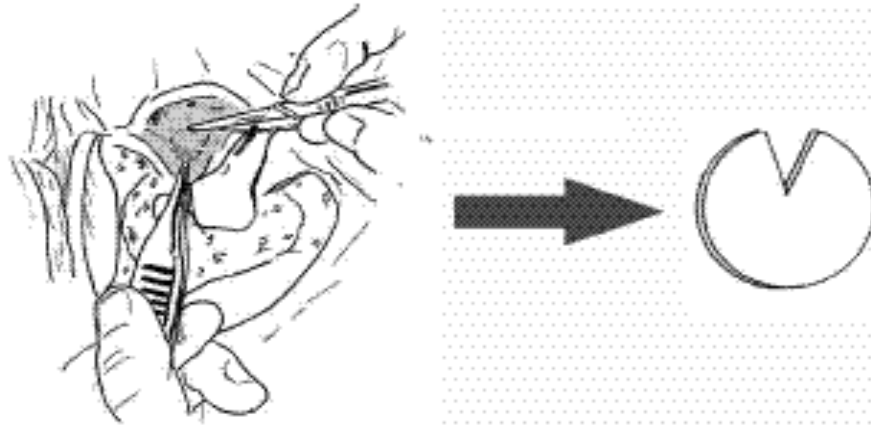
placed in an underlay fashion, with the cartilage toward the promontory and the perichondrium adjacent to the tympanic membrane remnant, both of which are medial to the malleus . Gelfoam is packed anteriorly to support the graft at the anterior annulus.



CARTILAGE “SHIELD”

TYMPANOPLASTY TECHNIQUE

Total tympanic membrane replacement with cartilage. The canal incisions, flap elevation, and preparation of the middle ear and tympanic membrane remnant are as similar to routine myringoplasty. Cartilage is removed either from the posterior aspect of the concha /cymba concha or from the tragus using sharp and blunt dissection. The cartilage graft is stripped of its perichondrium, sized to the dimensions of the tympanic membrane defect, and thinned. A wedge is removed at the upper portion of the graft to accommodate the malleus handle. After the middle ear is packed with Gelfoam, the cartilage graft is placed medial to the manubrium and the tympanic sulcus. An areolar tissue graft is placed lateral to the cartilage and medial to the edges of the perforation and extended posteriorly onto the canal wall.



There is some controversy as to whether mastoidectomy should be added to the surgical management of the atelectatic ear. While, theoretically, aeration of the middle ear may be

improved by creating a larger air-containing reservoir, clinical data does not support this premise . As a result, mastoidectomy is not routinely included in the surgical regimen performed at this institution.but to visualise the retraction pockets we drill some part of bone.

In cases of medialised malleus we cut the tensor tympani or tip of the malleus to lateralize it and thereby increase the mesotympanic space.For ossicular reconstruction we used the Incus interposition technique .For reporting about middle ear status we used the following middle ear risk index reporting system.

MERI

Otorrhea (Bellucci)

- ❖ I: Dry 0
- ❖ II: Occasionally wet 1
- ❖ III: Persistently wet 2

Perforation

- ❖ Absent 0
- ❖ Present 1

Cholesteatoma

- ❖ Absent 0
- ❖ Present 1

Ossicular status (Austin/Kartush)

- ❖ 0: M+I+S+ 0
- ❖ A: M+S+ 1
- ❖ B: M+S– 2
- ❖ C: M–S+ 3
- ❖ D: M–S– 4
- ❖ E: Ossicle head fixation 2
- ❖ F: Stapes fixation 3

Middle ear: granulations or effusion

- ❖ No 0
- ❖ Yes 1

Previous surgery

- ❖ None 0
- ❖ Staged 1
- ❖ Revision2

Grading-

1-3- mild

4-6-moderate

7-12- severe middle ear risks.

POST-OP CARE

- ❖ 1-2 wks- removal of gelfoam and ointment
- ❖ 3-4 wks- antibiotic+steroid ear drops
- ❖ 6-8wks-1st post op audiogram
- ❖ Follow up for 6 months

DATA COLLECTION

Surgeries done between 2010-2012 were included. Patients were included if pre- and post-operative audiograms were available, with at least a 6 month follow-up after surgical intervention. All surgeries were performed by the faculties of this institute.

After the patient's inclusion in the study, the following information was extracted from his or her chart: sex, age, surgical indication, type of ossicular reconstruction, pre- and post-operative audiograms, post-operative findings, and length of follow-up. Three - frequency (500, 1000, 2000 Hz) air and bone conduction puretone averages (PTAs) were used to calculate PTA air-bone gaps (ABGs). The air and bone conduction scores obtained at the most recent follow-up were used to compute the post-operative results. Statistical comparison between the pre- and postoperative audiograms was performed using the Student's t-test.

RESULTS

A COMPREHENSIVE STUDY ON CARTILAGE TYMPANOPLASTY FOR ADHESIVE OTITIS MEDIA

AGE

	N	Minimum	Maximum	Mean	SD
AGE	31	13	48	28.77	10.115

SEX

	Frequency	Percent
Valid Male	19	61.3
Female	12	38.7
Total	31	100

SIDE

	Frequency	Percent
Valid Right	12	38.7
Left	17	54.8
Both	2	6.5
Total	31	100

OSSICULAR CONTINUITY

	Frequency	Percent
Valid Present	19	61.3
Absent	12	38.7
Total	31	100

SURGICAL INTERVENTION

	Frequency	Percent
Valid CT	19	61.3
CT OSS	12	38.7
Total	31	100

ETIOLOGY

SINUSITIS

	Frequency	Percent
Valid Yes	4	12.9
No	27	87.1
Total	31	100

ADENOID

	Frequency	Percent
Valid Yes	3	9.7
No	28	90.3
Total	31	100

ALLERGIC

	Frequency	Percent
Valid Yes	11	35.5
No	20	64.5
Total	31	100

LPR

	Frequency	Percent
Valid Yes	2	6.5
No	29	93.5
Total	31	100

SMOKING

	Frequency	Percent
Valid Yes	5	16.1
No	26	83.9
Total	31	100

LUNG DISEASE

	Frequency	Percent
Valid Yes	1	3.2
No	30	96.8
Total	31	100

PRE-OP PTA VS POST-OP PTA

	Mean	SD	Significance
Pair PTA-PRE OP	47.74	11.582	0.00
1 PTA-3 MONTHS	26.45	4.877	
Pair PTA- PRE OP	47.74	11.582	0.00
2 PTA-6 MONTHS	26.55	5.603	
Pair PTA-3 MONTHS	26.45	4.877	0.878
3 PTA-6 MONTHS	26.55	5.603	

PRE-OP ABG VS POST-OP ABG

	Mean	SD	Significance
Pair ABG-PRE OP	32.45	11.863	0.00
1 ABG-3 MONTHS	15.23	2.825	
Pair ABG- PRE OP	32.45	11.863	0.00
2 ABG-6 MONTHS	15.48	3.548	
Pair ABG-3 MONTHS	15.23	2.825	0.60
3 ABG-6 MONTHS	15.48	3.548	

INTACTNESS OF TM-POST OP3

	Frequency	Percent
Valid Yes	30	96.8
No	1	3.2
Total	31	100

INTACTNESS OF TM-POST OP6

	Frequency	Percent
Valid Yes	29	93.5
No	2	6.5
Total	31	100

CARTILAGE USED

	Frequency	Percent
Valid TRAGUS	14	45.2
CON	15	48.4
CYM	2	6.5
TOTAL	31	100

STATUS OF OTHER EAR DURING SURGERY

	Frequency	Percent
Valid NORMAL	11	35.5
GRADE 1	12	38.7
GRADE 2	5	16.1
GRADE 3	1	3.2
GRADE 4	1	3.2
RES PERFORATION	1	3.2
TOTAL	31	100

PTA AND TYPE OF CARTILAGE USED

	Mean	SD	Significance
PTA-3MONTHS TRAGUS	24.29	3.970	0.036
CON	28.73	4.964	
CYM	24.50	3.536	
TOTAL	26.45	4.877	
PTA-6MONTHS TRAGUS	24.71	4.531	0.119
CON	28.67	6.079	
CYM	23.50	4.950	
TOTAL	26.55	5.603	

ABG AND TYPE OF CARTILAGE USED

	Mean	SD	Significance
ABG-3MONTHS TRAGUS	13.86	1.610	0.017
CON	16.67	3.222	
CYM	14.00	0.000	
TOTAL	15.23	2.825	
ABG-6MONTHS TRAGUS	13.79	1.718	0.020
CON	17.27	4.200	
CYM	14.00	0.000	
TOTAL	15.48	3.548	

**HEARING RESULTS ACCORDING TO SURGICAL
INTERVENTION(PTA)**

HEARING RESULTS BY SURGICAL	Mean	SD	Significance
PTA-3MONTHS CT	23.58	2.950	0.000
CT OSS	31.00	3.717	
PTA-6MONTHS CT	23.42	3.271	0.000
CT OSS	31.50	4.945	

**HEARING RESULTS ACCORDING TO SURGICAL
INTERVENTION(ABG)**

HEARING RESULTS BYSURGICALINTREVENTION	Mean	SD	Significance
ABG-3MONTHS CT	14.00	1.563	0.001
CT OSS	17.17	3.326	
ABG-6MONTHS CT	13.95	1.649	0.001
CT OSS	17.92	4.400	

OSSICULAR CONTINUITY	Mean	SD	Significance
PTA-PREOP PRESENT	39.47	5.337	0.000
ABSENT	60.83	3.762	
PTA-3MONTHS PRESENT	23.58	2.950	0.000
ABSENT	31.00	3.717	
PTA-6MONTHS PRESENT	23.42	3.271	0.000
ABSENT	31.50	4.945	

OSSICULAR CONTINUITY	Mean	SD	Significance
ABG-PREOP PRESENT	24.05	5.845	0.000
ABSENT	45.75	3.621	
ABG-3MONTHS PRESENT	14.00	1.563	0.001
ABSENT	17.17	3.326	
ABG-6MONTHS PRESENT	13.95	1.649	0.001
ABSENT	17.92	4.400	

**A COMPARISON ON HEARING OUTCOME WITH
REGARD TO CARTILAGE USED IN TYPE 1
TYMPANOPLASTY**

	N	Mean	SD	Significance
PTA-3MONTHS TRAGUS	10	22.20	1.619	0.088
CON	7	25.29	3.638	
CYM	2	24.50	3.536	
TOTAL	19	23.58	2.950	
PTA-6MONTHS TRAGUS	10	22.80	3.490	0.679
CON	7	24.29	2.870	
CYM	2	23.50	4.950	
TOTAL	19	23.42	3.271	
ABG-3MONTHS TRAGUS	10	13.30	1.567	0.080
CON	7	15.00	1.291	
CYM	2	14.00	0.000	
TOTAL	19	14.00	1.563	
ABG-6MONTHS TRAGUS	10	13.30	1.767	0.161
CON	7	14.86	1.345	
CYM	2	14.00	0.000	
TOTAL	19	13.95	1.649	

HEARING OUTCOME BY ETIOLOGY	NO.OF EARS	MEAN	SD	SIGNIFICANCE
PREOP PTA				
TREATED	8	44.25	9.886	0.330
NOT TREATED	23	48.96	12.07	0.292
POSTOP 3rdMONTH PTA				
TREATED	8	25.38	5.041	0.478
NOT TREATED	23	26.83	4.877	0.493
POSTOP 6th MONTH PTA				
TREATED	8	24.25	5.148	0.182
NOTTREATED	23	27.35	5.638	0.176

HEARING OUTCOME BY ETIOLOGY	NO.OF EARS	MEAN	SD	SIGNIFICANCE
PREOP ABG				
TREATED	8	29.13	9.628	0.366
NOT TREATED	23	33.61	12.529	0.312
POSTOP 3rdMONTH ABG				
TREATED	8	15.13	1.959	0.909
NOT TREATED	23	15.26	3.107	0.888
POSTOP 6th MONTH ABG				
TREATED	8	14.63	2.134	0.436
NOTTREATED	23	15.78	3.919	0.309

Between 2010 and 2012, a total of 30 patients (representing 31 ears) underwent surgery using cartilage tympanoplasty techniques for adhesive otitis media. The

average age was 28 years, with a range of 13 to 48 years. 12 patients were female, and 19 were male. The . follow-up period was 6 months.

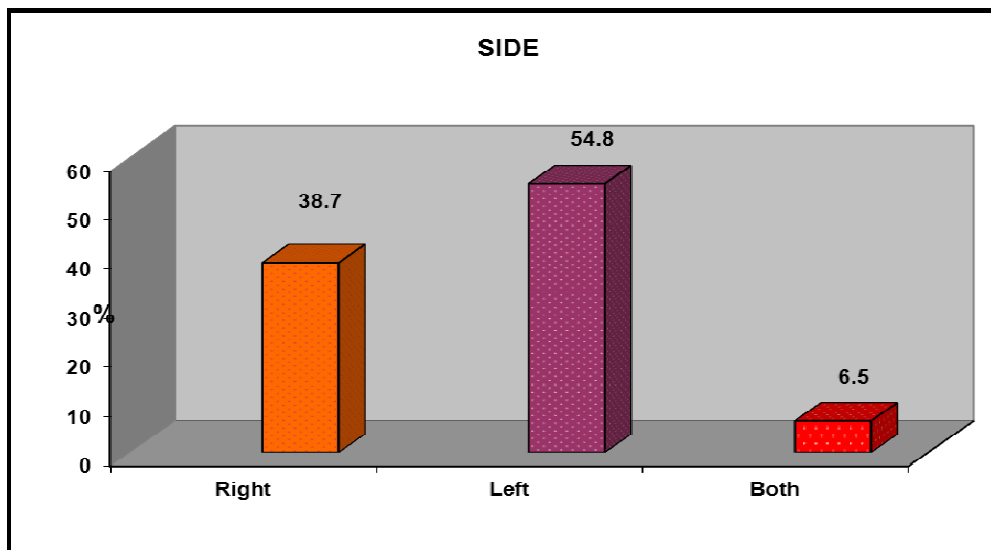
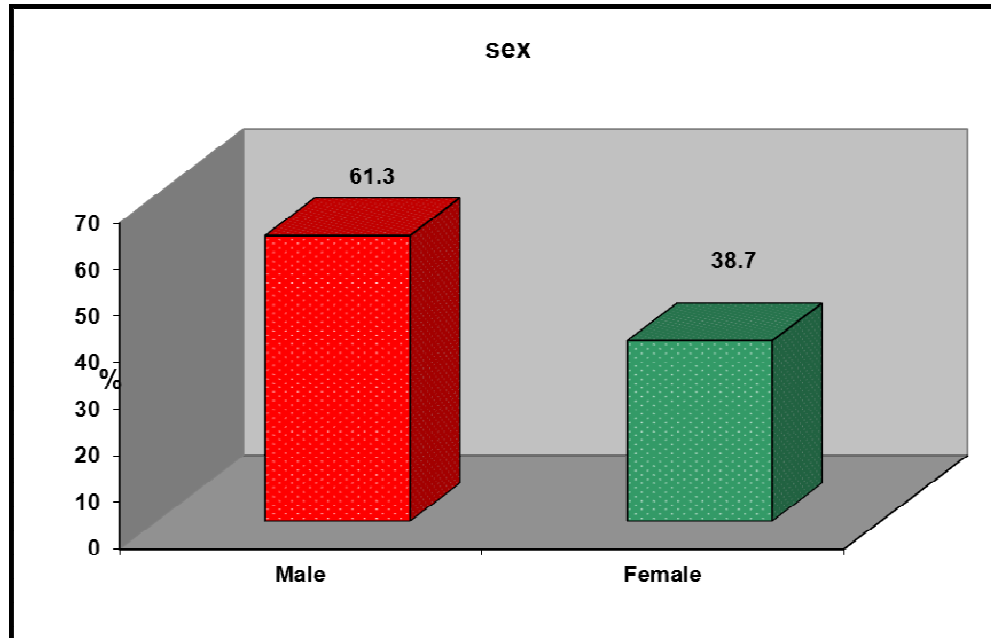
Of the surgeries performed, 19 were type I cartilage tympanoplasties and 12 were cartilage tympanoplasties with ossicular reconstruction. All the patients had sclerosed mastoid in their X-ray mastoids. Ossicles were intact in 19 ears where we did cartilage tympanoplasty type 1 and 12 ears were without intact ossicular continuity where we did cartilage tympanoplasty with ossiculoplasty. Commonest ossicle found to be eroded was lenticular process of incus followed by the stapes head. Malleus found to be retracted in most of the cases where we cut the tensor tympani muscle or cut the tip of the malleus to lateralize it. We did the ossicular reconstruction using incus interposition technique. All the ears fall in MERI mild category (score 1-3). Intraoperatively no ear had glue. Commonest etiology for adhesive otitis media in my study was allergy (35.5%) followed by smoking (16.1%). Mean preop PTA was 47.74 ± 11.582 dB. post op PTA at 3rd month is 26.45 ± 4.877 dB and at 6th month post op PTA is 26.55 ± 5.603 dB. There was significant improvement

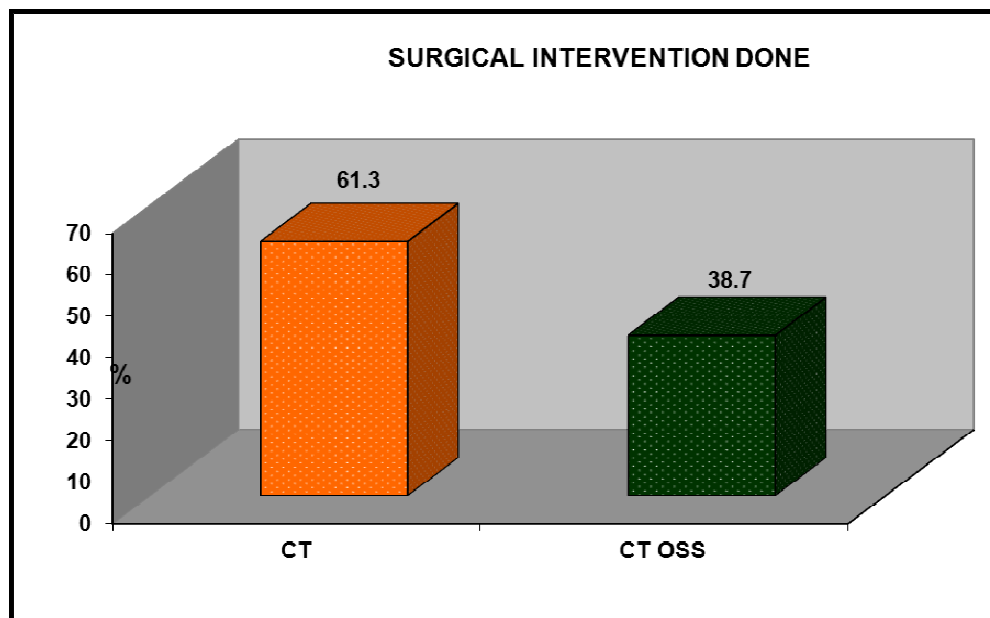
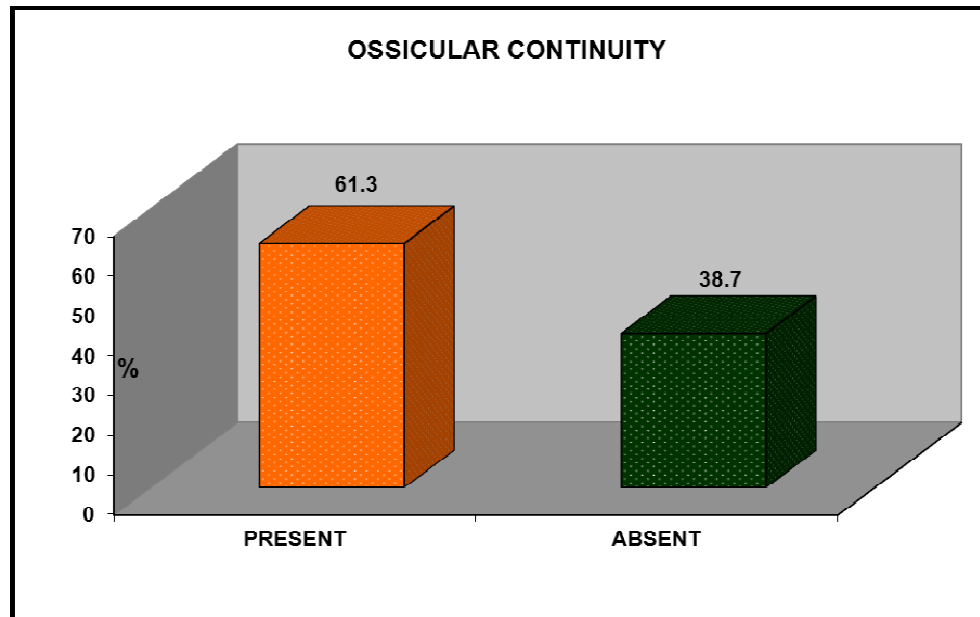
between preop and post op PTA for both 3rd and 6th month(p is $.000 < 0.05$).but no significant difference between 3rd & 6th month.Pre op ABG is 32.45 ± 11.863 dB and post op ABG at 3 and 6 months are 15.23 ± 2.825 dB and 15.48 ± 3.548 dB respectively. There was a significant difference between preop & post op values. Average AB CLOSURE was 16.97 dB. at the end of 6 months two cases had residual perforation our success rate was 93.5 %. Among the cartilages used ,we used conchal in 15 ears and tragus in 14 ears and cymba concha in 2 cases. One case was operated by cartilage island graft technique and rest by cartilage shield technique. Grade 2 retraction was commonly present in the other ear during surgery. Mean post op PTA at 6 months in cartilage tympanoplasty was 23.42 ± 3.271 dB .In cartilage tympanoplasty with ossiculoplasty it was 31.50 ± 4.945 dB. Mean ABG was 13.95 ± 1.649 dB in cartilage tympanoplasty alone and 17.92 ± 4.400 dB in cartilage tympanoplasty with ossiculoplasty .Thus a statistically significant improvement in hearing was seen in patients undergoing Type I tympanoplasties and in those receiving ossicular reconstruction ($p < 0.05$). Interestingly, there was no significant difference in hearing results between these two

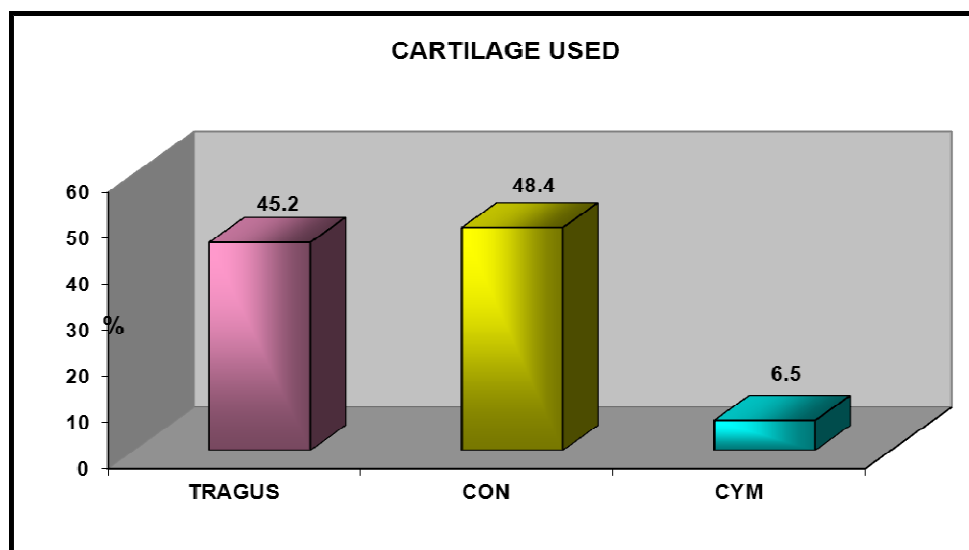
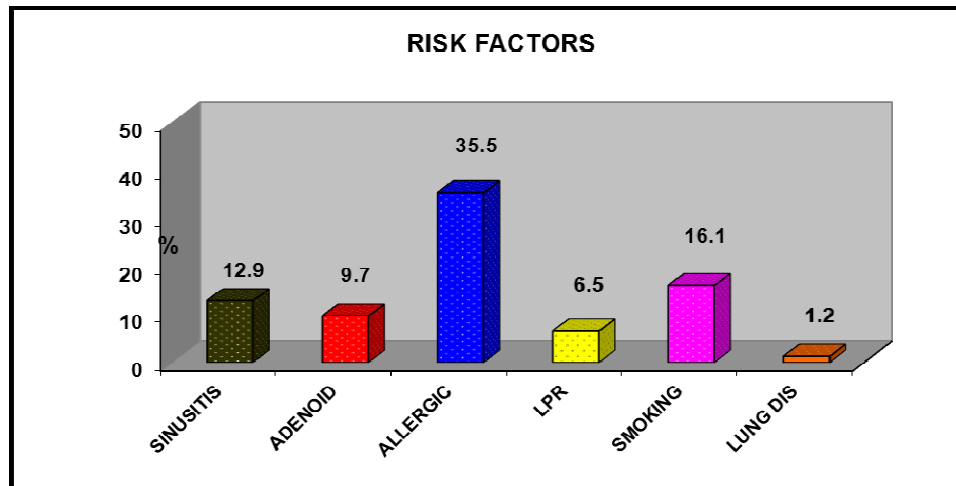
groups .In the cases where only cartilage tympanoplasty alone done post op PTA at 6 months for tragal is $22.80 \pm 3.490\text{dB}$ conchal $24.29 \pm 2.870\text{dB}$ cymba $23.50 \pm 4.950\text{dB}$ &for ABG tragus 13.30 ± 1.767 conchal 14.86 ± 1.345 and cymba 14 dB which shows tragus slightly better than other two in hearing improvement which is not that significant.Allergy followed by smoking was the commonest etiology identified for Eustachian tube dysfunction in my study.when hearing outcomes of the patients whose identified etiology was treated to those with untreated etiology,there were no statistically significant difference of the hearing outcome.among the two patients who had perforation at the end of 6th month one had allergic etiology and the other patient is a chronic smoker.

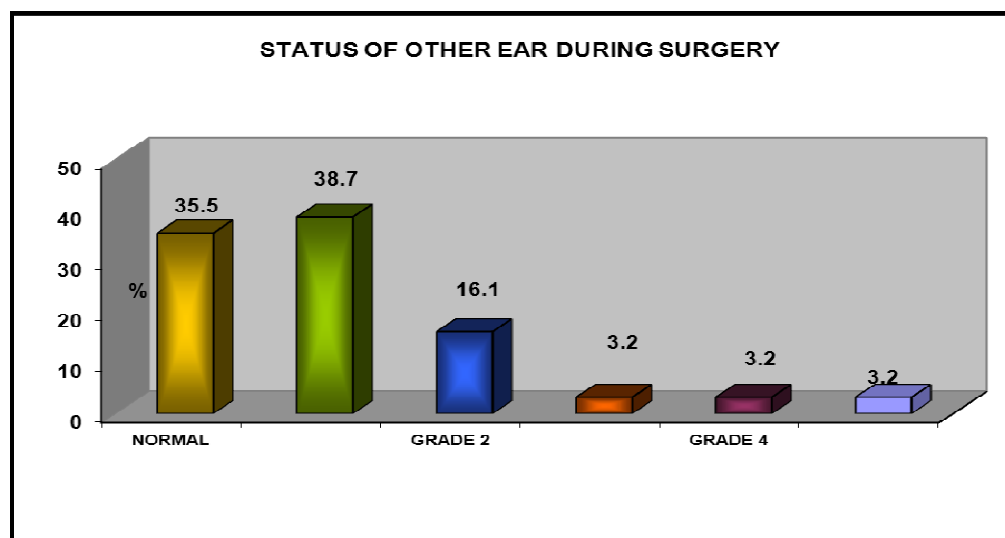
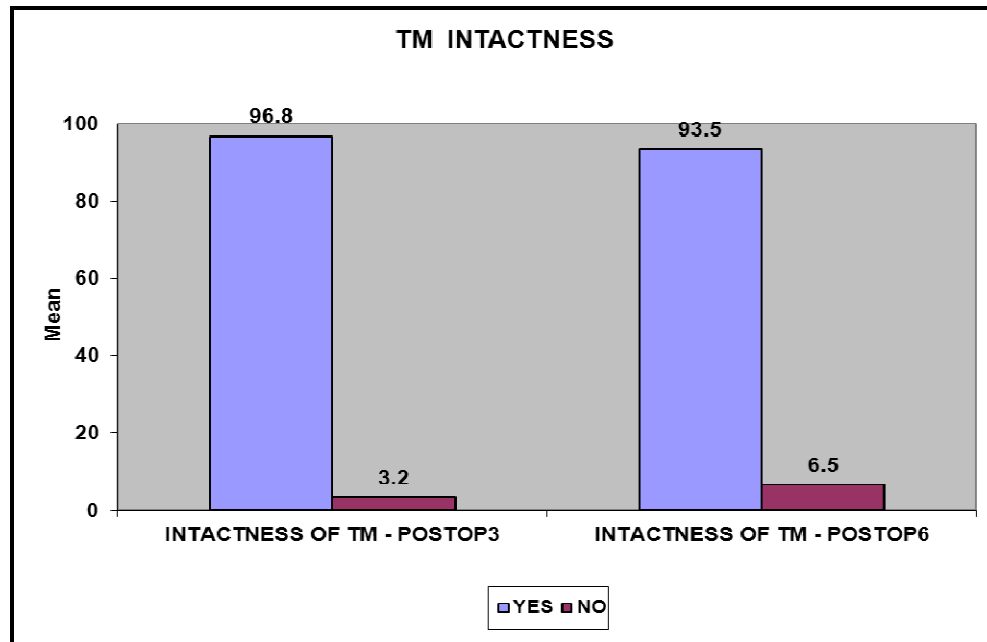
There were no serious complications seen in any patient.All patients who had bony curetting of posterosuperior meatal wall had an intact taste sensory perception. All ears showed intact grafts except 2 patients at the most recent follow-up.There were no significant retractions. Small, local retractions around the edge of the cartilage graft were seen in 2 ears. These have remained stable and are believed to be

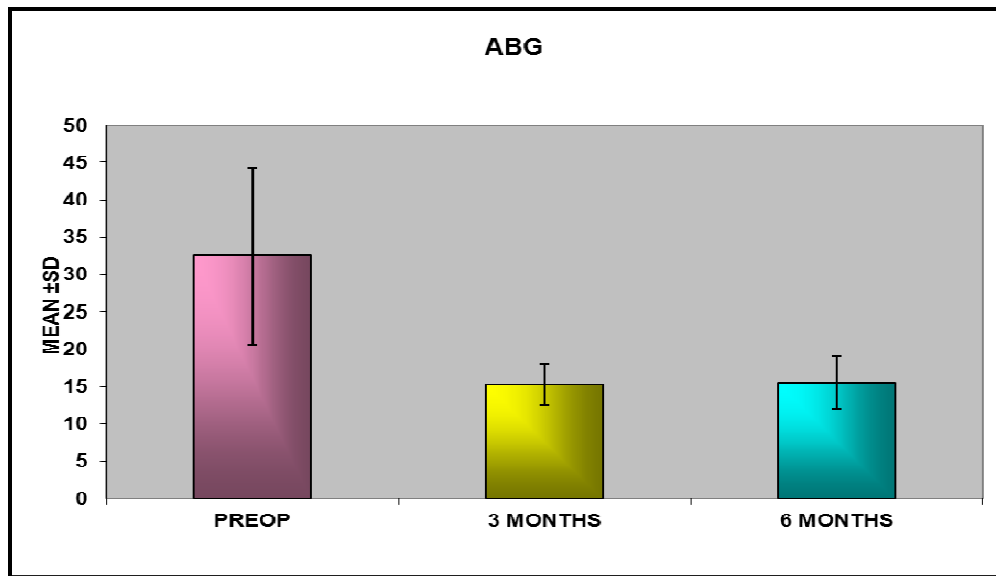
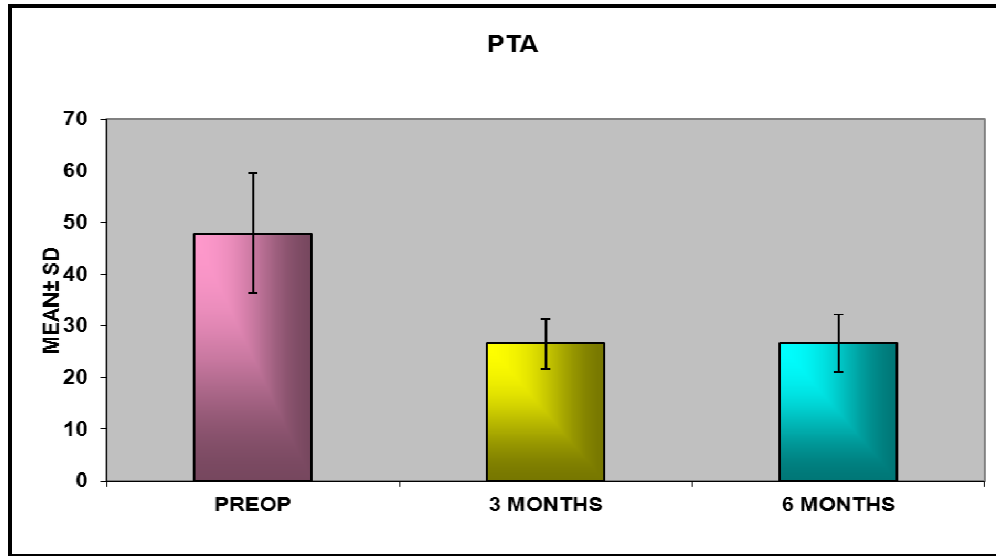
clinically insignificant. All patients had significant hearing improvement. No patient required ventilation tubes for persistent effusion in the post-operative period.

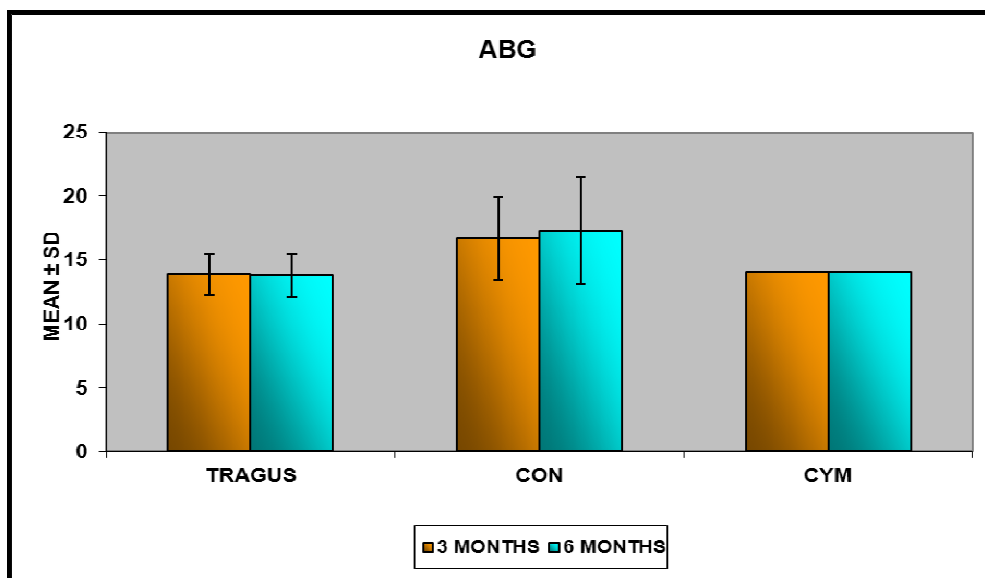
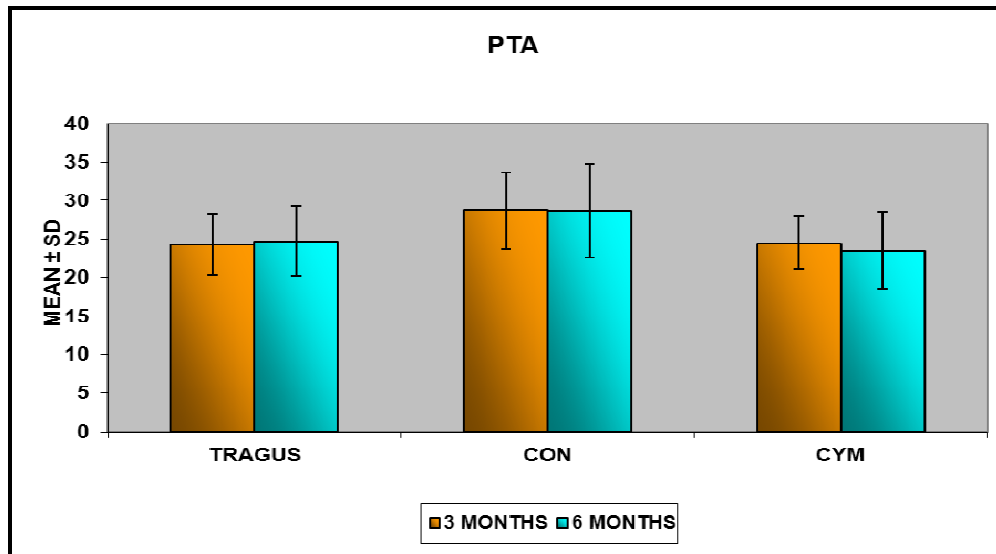


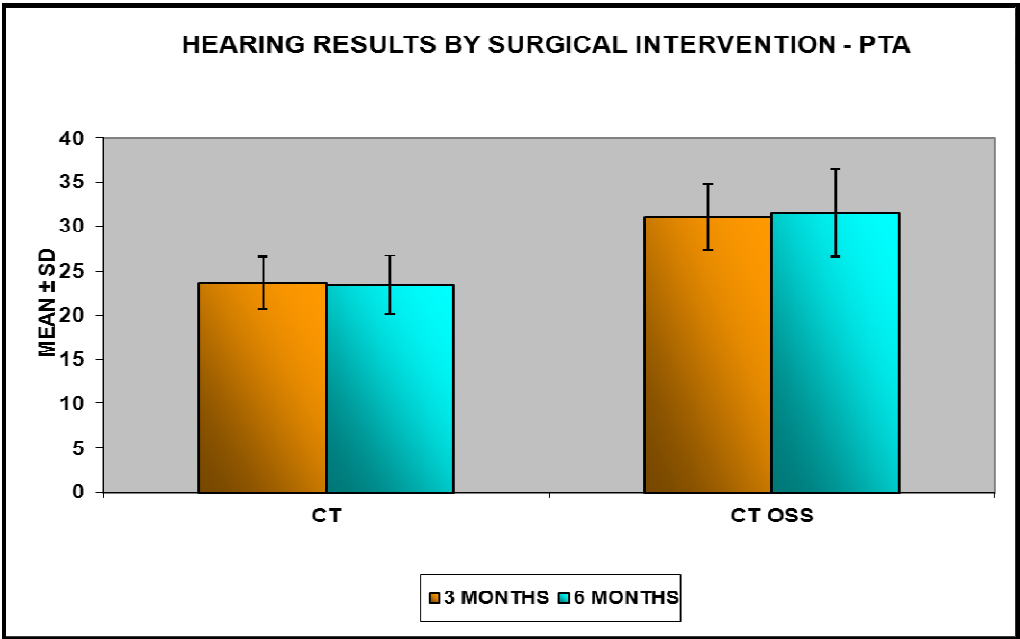
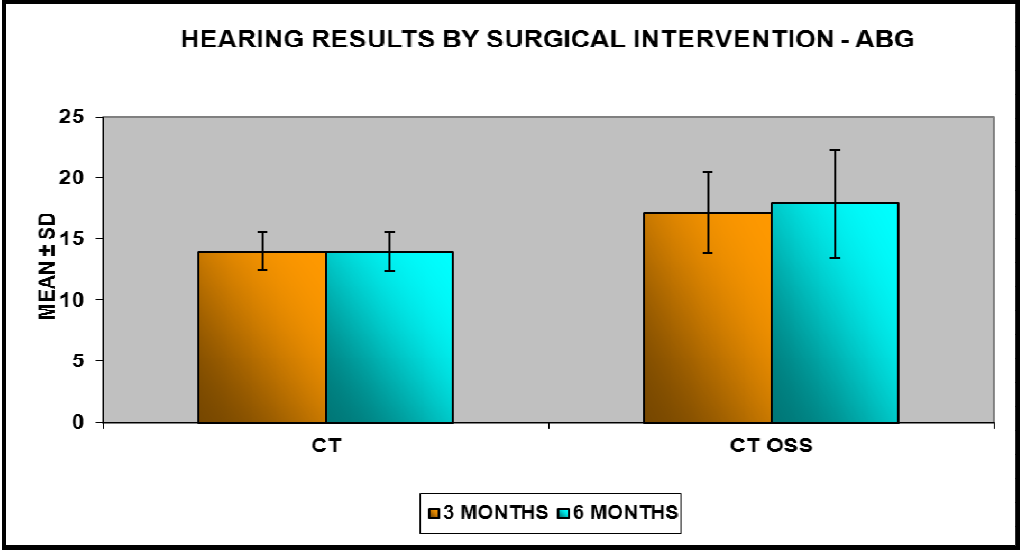












DISCUSSION

Much of the controversy regarding the management of the atelectatic ear stems from a poor understanding of the development and progression of this disease. The literature by providing a wide variation in the reported incidence of this disease and the rate with which complications are seen to develop gives lot of confusion regarding the management . For example, in otherwise healthy children, the prevalence of *pars tensa* retractions with significant abnormalities, such as atrophy, is reported to be between 0.7% and 10% (7,8). Progression of the disease, with cholesteatoma formation, has been reported to occur in 1% to 55% of patients after 1- to 15-year follow-ups in an at-risk group of patients (8,9).

These variations in the literature is because of the lack of a uniform definition and staging system for tympanic membrane retractions. It is difficult to assess the reported rate

of development of serious structural changes based on reports in the literature because the severity of these structural changes at initial diagnosis varied greatly from patient to patient, as did the number and types of interventions performed to treat the disease. Certainly, if type I retraction described in the present classification scheme, is included the incidence of the disease would be quite high and the complication rate low, as opposed to only including a type IV retraction. Developing a logical staging system is thus imperative before introducing a treatment protocol and ultimately attempting to understand the natural history of the atelectatic ear.

Several staging systems have been developed, and each has its advantages and disadvantages. A three grade staging system described by Charachon et al. is based on the presence and absence of adhesions, as determined by pneumatic otoscopy as well as by the ability to inspect the depth of retraction (10).

The type V designation in Sade's system suggests that perforation is the natural progression of the atelectatic ear. However, this is not necessarily the case as mesotympanic cholesteatoma is frequently the end-point of a deep retraction pocket. From the standpoint of describing the natural progression of the disease, it seemed logical to omit the presence of perforation in the staging system. Type V was therefore not included in our staging system. We call an ear as adhesive otitis media, when there is a presence of adhesions making contact to the promontory, especially when Valsalva does not produce movement of tympanic membrane.

The management protocol used in our institute is fairly aggressive surgically. Most would not argue with the logic of surgical intervention in a Sade type IV retraction due to the inability to rule out incipient cholesteatoma, if retraction now down to the promontory, progression occurs from this point,

especially if adhesions are present posteriorly, the resulting mesotympanic cholesteatoma will ultimately involve the sinus tympani and facial recess areas, the two most difficult areas for cholesteatoma eradication. Involvement of the sinus tympani almost guarantees the need for staged surgery, as no surgical technique for cholesteatoma removal, even canal-wall-down surgery, adequately deals with this area. The second reason involves hearing loss. With a type II retraction, or myringo-incudo-stapediopexy, the mechanical advantage produced by the lever action of the incus is certainly reduced, but the acoustic gain offered by this mechanism in the normal ear is minimal, so the resulting hearing loss is negligible (11). ,with a type III retraction, the effective surface area of the vibrating tympanic membrane is reduced by its contact to the promontory. In the normal ear, the hearing gain produced by the ratio of the surface area of the tympanic membrane to the oval window is

significant, so the resulting hearing loss in the type III retraction is notable (11) . While this degree of hearing loss may not be, in and of itself, an indication for surgery, it is testimony to the importance of the ratio of the surface area of the tympanic membrane to the oval window. The hearing gain afforded by surgery in these cases reinforces the aggressive surgical treatment of the type 4 retraction.

The surgical technique used here appears to offer a viable alternative in the management of type IV atelectatic ears. The ultimate hearing results were quite encouraging, and hearing was either maintained or improved . Even patients undergoing only a type I tympanoplasty, with no reconstruction, fared well, with an overall improvement of hearing. Certainly, this group of patients was most at risk for having a detrimental surgical result with regards to hearing as the hearing loss in this subset of patients was frequently mild preoperatively.

our hearing results compare favorably to those reported by other authors (10,13).

A final comment concerns our graft material. Cartilage appears to be an ideal graft material in the atelectatic middle ear as it offers rigorous reconstruction with little or no detrimental effect on hearing when compared to more traditional materials, such as fascia or perichondrium (4). It has been shown in both experimental and clinical studies that cartilage is well tolerated by the middle ear, and long-term survival is the norm (14,15). Although it is similar to fascia in that it is mesenchymal tissue, its more rigid quality tends to resist resorption and retraction, even in the milieu of continued Eustachian tube dysfunction (16). One distinct disadvantage of cartilage, however, is that it is difficult to intubate the ear in the post-operative period should that be necessary. Interestingly, although Eustachian tube dysfunction is felt to be the underlying cause of the atelectatic

ear, myringotomy and pressure equalizing tube insertion was not needed in this group. . if the patient is able to perform the Valsalva maneuver pre-operatively, the need for subsequent intubation is lesser , compared to the patient unable to perform the maneuver.

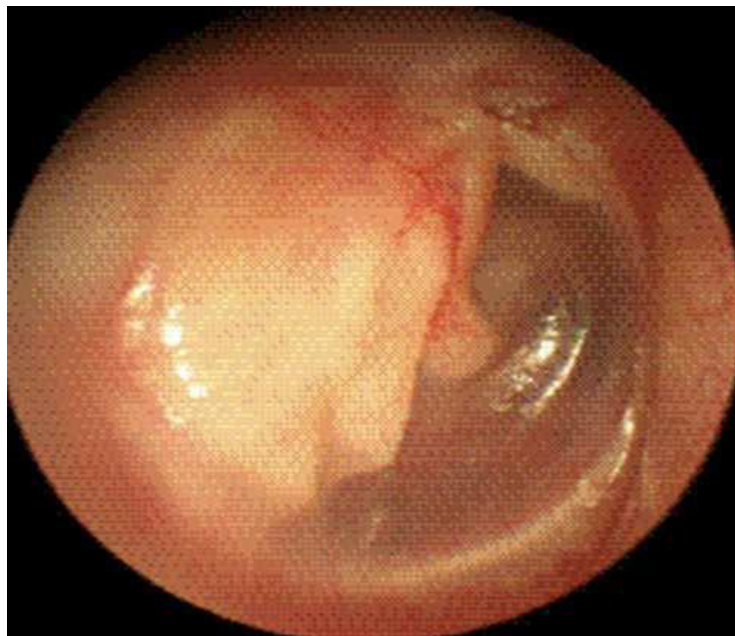
LIMITATIONS OF THE STUDY

- 1) Smaller sample size
- 2) This sample population does not represent the true population.
- 3) This study includes the surgical procedures done by various surgeons.
- 4) Follow up period is only 6 months.

PREOP PICTURES



POST OP PICTURES
AFTER ISLAND GRAFT



AFTER CARTILAGE SHIELD



CONCLUSION

Management of adhesive otitis media with cartilage perichondrium tympanoplasty with or without ossiculoplasty is a proven modality of treatment with successful results. Cartilage gives a tensile strength to the tympanic membrane which prevents further retractions inspite of the continuing eustachian tube dysfunction and thus prevents cholesteatoma formation without compromising on hearing.

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PROFORMA

Name:		IP No:	
Age:		Address:	
Sex:			
Occupation:		Socio economic status:	

Presenting complaints

	Side	Duration
Ear discharge		
Hard of hearing		
Ringing sound in ear		
Swelling around ear		

History of present illness

Ear discharge	Side
	Duration
	Onset- insidious / sudden
	Type – watery / mucoid / mucopurulent
	Amount – scanty / profuse
	Intermittent / continuous
	Aggravating factors / relieving factors
Hard of hearing	Side
	Duration
	Onset- insidious / sudden
	Progression
	Severity – hears normal / loud conversation
	Associated family history
	Aggravating / relieving factors
Ringing sound in ear	Side
	Duration
	Progression
	Character

Past history

History of diabetes mellitus / hypertension / tuberculosis / drug intake / exanthematous fever / previous surgeries

Personal history

Smoking / alcohol / nutritional status

Local examination

Ear		Right	Left
Pinna			
Pre / post auricular region			
External auditory canal			
Tympanic membrane			
Fistula test			
Three finger test			
Facial nerve functions			
Tuning fork tests	Rinne		
	Weber		
	ABC		

Nose Examination

Throat Examination

General Examination

Provisional Diagnosis

INVESTIGATIONS:

EOT

Pure tone audiometry

Diagnostic nasal endoscopy

X-Ray both mastoids – lateral oblique view

Routine blood / urine investigations

TREATMENT

Cartilage Tympanoplasty

POST OPERATIVE FOLLOW UP:

1. Tympanic membrane status
2. Pure tone audiometry.

INSTITUTIONAL ETHICS COMMITTEE
MADRAS MEDICAL COLLEGE, CHENNAI -3

Telephone No : 044 25305301
Fax : 044 25363970

CERTIFICATE OF APPROVAL

To
Dr. V. Saravana Selvan
PG in MS ENT
Madras Medical College, Chennai -3

Dear Dr. V. Saravana Selvan

The Institutional Ethics committee of Madras Medical College, reviewed and discussed your application for approval of the proposal entitled " A comprehensive study on cartilage tympanoplasty in adhesive otitis media " No. 02112011

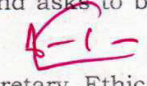
The following members of Ethics Committee were present in the meeting held on 22.11.2011 conducted at Madras Medical College, Chennai -3.

- | | |
|--|---------------------|
| 1. Prof. S.K. Rajan. MD | -- Chairperson |
| 2. Prof. A. Sundaram MD
Vice principal, Madras Medical College, Ch -3 | -- Member Secretary |
| 3. Prof. R. Nandhini MD
Director, Institute of Pharmacology ,MMC, Ch-3 | -- Member |
| 4. Prof. Pregna B. Dolia MD
Director , Institute of Biochemistry, MMC, Ch-3 | -- Member |
| 5. Prof. C. Rajendiran, MD
Director , Inst. Of Internal Medicine, MMC, Ch-3 | -- Member |
| 6. Prof. Md Ali MD. DM
Prof & Head , Dept. of MGE, MMC, Ch-3 | -- Member |
| 7. Prof. Shantha Ravishankar MD
Prof of Neuropathology, MMC, Ch-3 | -- Member |
| 8. Thiru. S. Govindsamy. BA BL | -- Lawyer |
| 9. Tmt. Arnold soulina MA | -- Social Scientist |

We approve the proposal to be conducted in its presented form.

Sd/ Chairman & Other Members

The Institutional Ethics Committee expects to be informed about the progress of the study, and SAE occurring in the course of the study, any changes in the protocol and patients information / informed consent and asks to be provided a copy of the final report.


Member Secretary, Ethics Committee

INFORMATION SHEET

சுய ஒப்புதல் படிவம்

STUDY TITLE : A COMPREHENSIVE STUDY ON CARTILAGE
TYMPANOPLASTY IN ADHESIVE OTITIS MEDIA

ஆய்வுசெய்யப்படும் தலைப்பு:

குறுத்தெலும்பால் காது சவ்வினை சீரமைத்தல் தொடர்பான ஆய்வு

MS ENT Post-Graduate,
Madras Medical College, Chennai.

சென்னை மருத்துவக் கல்லூரி, காது, மூக்கு, தொண்டை துறையில் பயிலும் முதுகலை மருத்துவர் V. சரவணசெல்வன், அவர்கள் மேற்கொள்ளும் இந்த ஆய்வில் பங்குகொள்ள ஆகிய நான் முழுமனதுடன் சம்மதிக்கிறேன். இந்த ஆய்வை மேற்கொள்ளும் மருத்துவர் என் மருத்துவ விவரங்கள் மற்றும் மருத்துவ ஆய்வின் முடிவுகள் ஆகியவற்றை தெரிந்துகொள்ளவும், அனைத்து பரிசோதனைகளுக்கும் முழு மனதுடன் சம்மதிக்கிறேன். இந்த ஆய்வினால் எந்த தீங்கும் ஏற்படாது என்பதையும் அறிவேன். மேலும் இந்த ஆய்வின் முடிவுகளை பிரசுரிக்கவும் சம்மதிக்கிறேன்.

பங்கேற்பவரின் கையொப்பம்..... இடம்..... தேதி.....
கட்டைவிரல் ரேகை

Adhesive otitis media is a condition where the tympanic membrane is plastered over the medial wall of middle ear, resulting in cholesteatoma formation and hearing loss. It is proven doing this study to analyze the anatomical and audiological results in cartilage tympanoplasty done in our institute for the management of adhesive otitis media.
ஆய்வாளரின் கையொப்பம்..... இடம்..... தேதி.....

The study will be done after doing necessary investigations, thirty patients will be included in the study and a written informed consent only. Extra cost will not be incurred to the patient by this study. Any doubt regarding the study will be willingly clarified. Results of the study will be published.

CONSENT FORM

STUDY TITLE : A COMPREHENSIVE STUDY ON CARTILAGE
TYMPANOPLASTY IN ADHESIVE OTITIS MEDIA

I _____ hereby give consent to participate in the study conducted by Dr. V. SARAVANA SELVAN, Post Graduate in Upgraded Institute of Otorhinolaryngology, Madras Medical College & Rajiv Gandhi Govt. General Hospital, Chennai and to use my personal clinical data and result of investigation for the purpose of analysis and to study the nature of disease. I also give consent for further investigations.

Signature / Thumb impression
of the patient / relative

Place

Date

Patient Name and Address

Signature of the Investigator

Signature of the Guide

NAME	AGE	SEX	IPNO	DIAG	SIDE	OSSI CON	PROC	SINUSITIS	ADENOID	ALLERGIC	LPR	SMOKING	LUNG DIS	PRE OP	
														PTA	ABG
SEKAR	20	M	31245	AOM	LT	PRESENT	LT CT	Y	N	N	N	N	N	40	25
NAGAMANI	26	F	24523	AOM	LT	ABSENT	LT CT OSS	N	N	Y	N	N	N	60	45
CHANDRU	13	M	53426	AOM	LT	ABSENT	LT CT OSS	N	Y	N	N	N	N	62	46
SHYAMALA	42	M		AOM	RT	ABSENT	RT CT OSS	N	N	Y	N	N	N	64	48
MALARVIZHI	31	F		AOM	LT	PRESENT	LT CT	N	N	N	N	N	N	44	30
FATHIMA	30	F	49159	AOM	RT	PRESENT	RT CT	N	N	Y	N	N	N	42	28
NIRMALA	30	F	98822	AOM	RT	ABSENT	RT CT OSS	N	N	Y	Y	N	N	64	48
DEVI	13	F	113001	AOM	LT	PRESENT	LT CT	N	Y	N	N	N	N	35	20
PANDIARAJ	19	M	114634	AOM	LT	PRESENT	LT CT	N	Y	N	N	N	N	35	20
GAUTAM	25	M		AOM	RT	ABSENT	RT CT OSS	N	N	N	N	Y	N	62	47
ZARINA	29	F	34984	AOM	LT	PRESENT	LT CT	N	N	Y	N	N	N	35	20
UMA MAHESHWARI	35	F	87612	AOM	LT	PRESENT	LT CT	Y	N	N	N	N	N	45	30
RAJULU	24	M	10619	AOM	LT	PRESENT	LT CT	N	N	N	N	N	N	40	25
SATHIK	28	M	5249	AOM	RT	PRESENT	RT CT	N	N	N	N	N	N	35	20
SATHISH	18	M	35974	AOM	RT	PRESENT	RT CT	N	N	Y	N	N	N	35	20
UDHAYA	17	M		AOM	RT	PRESENT	RT CT	N	N	N	N	N	N	40	15
MOHANA	47	M	60887	AOM	LT	ABSENT	LT CT OSS	N	N	N	N	Y	N	60	47
PRAKASH	26	M	6399	AOM	LT	ABSENT	LT CT OSS	Y	N	N	N	N	N	50	35
RAMESH	42	M	68177	AOM	LT	PRESENT	LT CT	N	N	N	N	Y	N	35	20
MANIKANDAN	23	M	69272	AOM	LT	PRESENT	LT CT	N	N	N	N	N	Y	35	20
SEKAR	48	M	72296	AOM	LT	ABSENT	LT CT OSS	N	N	N	N	Y	N	62	47
RAMSUBARAO	25	M	74396	AOM	RT	ABSENT	RT CT OSS	N	N	Y	N	N	N	64	49
SEKAR	20	M	87765	AOM	RT	ABSENT	RT CT OSS	N	N	N	N	N	N	62	47
NAGAMANI	38	F	90491	AOM	LT	PRESENT	LT CT	Y	N	N	N	N	N	35	20
MOHANKUMAR	18	M	91378	AOM	LT	PRESENT	LT CT	N	N	Y	N	N	N	35	20
MOHAMMED THAKA	29	M	92325	AOM	RT	PRESENT	RT CT	N	N	N	N	Y	N	40	25
JANARTHANAN	16	M	62222	AOM	RT	ABSENT	RT CT OSS	N	N	N	N	N	N	60	45
SELVI	40	F	62861	AOM	RT	PRESENT	RT CT	N	N	Y	N	N	N	50	35
ANJALI DEVI	40	F	91763	AOM	LT	PRESENT	LT CT	N	N	N	Y	N	N	52	37
HEMAVATHI	40	F	34508	AOM	RT & LT	ABSENT	RT CT OSS	N	N	Y	N	N	N	60	45
HEMAVATHI	40	F		AOM		PRESENT	LT CT	N	N	Y	N	N	N	42	27

AOM-ADHESIVE OTITIS MEDIA, LT-LEFT, RT-RIGHT, CT-CATILAGE TYMPANOPLASTY, OSS-OSSICULOPLASTY, OSSI CON-OSSICULAR CONTINUITY, Y-YES, N-NO, NOR-NORMAL,

RES PERF+A35ORATION -RESIDUAL PERFORATION, PTA&ABG At 3rd&6th month after surgery, CON-CONCHAL CARTILAGE, CYM-CYMBAL CONCHA, TRAGUS, PTA- Pure Tone Average, ABG- Air Bone Gap

POSTOP 3		POSTOP6		INTACTNESS OF TM		STATUS OF OTHER EAR DURING SURGERY				CARTILAGE USED
PTA	ABG	PTA	ABG	POSTOP3	POSTOP6					
22	14	20	14	Y	Y	NOR				CYM
35	20	35	20	Y	Y	GR 2				CON
34	19	34	19	Y	Y	NOR				CON
30	15	30	15	Y	Y	GR1				TRAGUS
24	12	22	12	Y	Y	NOR				TRAGUS
20	10	20	10	Y	Y	GR1				TRAGUS
34	18	32	17	Y	Y	GR2				CON
24	15	22	15	Y	Y	NOR				TRAGUS
23	13	22	13	Y	Y	NOR				CON
25	15	25	14	Y	Y	GR2				TRAGUS
28	16	24	15	Y	Y	GR1				CON
22	14	21	14	Y	Y	NOR				TRAGUS
25	15	25	17	Y	Y	NOR				CON
24	15	24	15	Y	Y	NOR				CON
23	14	23	14	Y	Y	GR1				TRAGUS
21	14	21	14	Y	Y	NOR				CON
37	25	36	24	Y	Y	GR 1				CON
26	15	25	14	Y	Y	NOR				CON
21	13	32	16	N	N	GR2				TRAGUS
23	15	23	14	Y	Y	NOR				TRAGUS
32	20	30	19	Y	Y	GR1				CON
31	15	31	15	Y	Y	GR1				TRAGUS
28	14	26	14	Y	Y	GR3				CON
20	14	20	12	Y	Y	GR1				TRAGUS
21	14	21	14	Y	Y	GR1				TRAGUS
24	15	24	14	Y	Y	GR 2				CON
32	16	32	16	Y	Y	GR1				TRAGUS
27	14	27	14	Y	Y	GR1				CYM
32	17	30	16	Y	Y	GR1				CON
28	14	42	28	Y	N	AOM				CON
24	12	24	12	Y	Y	RES PERFORATION				TRAGUS

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DISSERTATION ON

**"A COMPREHENSIVE STUDY ON CARTILAGE
TYMPANOPLASTY IN ADHESIVE OTITIS MEDIA"**

Dissertation submitted
in partial fulfillment of the regulations
for the award of the degree of

M.S.DEGREE BRANCH-IV

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