OUTCOME OF AUGMENTED CARTILAGE TYMPANOPLASTY FOR THE MANAGEMENT OF TYMPANIC MEMBRANE RETRACTION POCKET IN PATIENTS WITH INACTIVE SQUAMOUS CHRONIC OTITIS MEDIA.

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ABSTRACT

Objectives:

To evaluate the outcome of augmented cartilage tympanoplasty for the treatment of tympanic membrane retraction pocket in patients with inactive squamous COM.

Materials and methods:

This Prospective, interventional study was conducted in the Department of ORL& HNS, NAMS, Bir Hospital, over a period of 3 years, between July 2017 to December 2000. Twenty-five consecutive patients having tympanic retraction pocket of early symptomatic charachon stage II without otorrhoea, keratin debris or cholesteatoma of age above 5 years were taken for the study. Augmented cartilage tympanoplasty was done after excision of the retraction pockets. The outcome of surgery in terms of graft uptake, hearing improvement and recurrence of disease were noted 12 weeks after the surgery. The patients were kept for continued follow up every three monthly thereafter. Follow-up ranged 3-18 months.

Results:

Out of 25 patients operated, 23 (92%) had successful graft uptake in one and half year observation period. One (4%) had small residual perforation without otorrhoea and one (4%) had mild re-retraction at postero-superior quadrant. The air-bone gap (ABG) improved in 12 (48 %), remained almost similar in 10(40%) and mild deterioration in three (12 %) patients.

Conclusion:

Augmented cartilage tympanoplasty in the early symptomatic patients of charachon stage II retraction pockets do not have significant hearing loss and recurrence of retraction after the surgery with advantage of prevention of choleasteatoma formation and ossicular erosion.

Keywords: Augmented cartilage tympanoplasty, Air bone gap, Tympanic membrane retraction, Inactive squamous COM

INTRODUCTION

Inactive squamous chronic otitis media is defined as retraction of the pars tensa or pars flaccida with the potential to be active with retained debris. It is commonly referred to as tympanic retraction or a retraction pocket. Retraction pockets of the tympanic membrane can be destructive, leading to loss of hearing, ossicular erosion, and development of cholesteatoma which is a destructive and expanding growth consisting of keratinizing squamous epithelium in the middle ear and/or mastoid process. They often become infected and can result in chronically draining ears. Treatment almost always consists of surgical removal. A retraction pocket is an invagination of part of the tympanic membrane (TM) into the middle ear cavity as a result of chronic otitis media.[1] It is a common condition and the prevalence of retractions involving the pars flaccida and pars tensa is quoted to be 14–26 % and 0.3–3.7 % respectively, in children aged 5–16 years.[2]. When retraction pocket become progressive, they may erode the adjacent structures and can cause otorrhoea, hearing loss and otalgia.

It is known that a weakened pars tensa in the presence of persistent eustachian tube dysfunction is the primary factor necessary for retraction.[3] Temporal bone studies demonstrate that the middle fibrous layer of the postero-superior quadrant of the pars tensa has a looser arrangement than the more compact anterior and postero-inferior quadrants.[4] The posterosuperior quadrant is also subject to greater inflammatory changes during acute otitis media and otitis media with effusion. As a result, there is selective degradation of the fibrous lamina propria leading to a weakened area that is more susceptible to retraction.[5]

Progressive retraction onto the incus can result in erosion of the long process and adhesion to the head of stapes.

Sade et al. found that in both pars tensa and pars flaccida regions, 2 % of untreated retractions developed cholesteatoma during an average three years follow up period.[6] Cases of patients with OME treated with ventilation tube insertion with or without adenoidectomy, between 1 and 4 % of ears developed attic cholesteatoma.[7]

The dilemma regarding the time of intervention has remained controversial for many years and this has led to a few grading systems to help the clinician decide. The classification by Tos and Poulsen relate to pars flaccida retractions[7] whereas Sade grades pars tensa retractions.[8] Despite these more popular classifications, the Charachon staging system particularly useful in directing management when combined with the patient's symptoms.[9] (Table 1)

Table 1. The Charachon grading system for tympanic membrane retraction pockets

Charachon stage	Definition
I	Mobile retraction pocket fully visible under microscope
II	Fixed and controllable. Retraction pocket fully visible under microscope
III	Fixed and uncontrollable. Deepest part of retraction pocket invisible under microscope

In order to prevent the complications of retraction, early intervention is often necessary. There are many options available to the clinician to prevent complications. A few of them are listed in Table 2. There are also a variety of effective surgical techniques chosen on the basis of severity of retraction and status of the ossicular chain.[10,11] The management of simple mobile retraction pockets (Charachon stage I) with ventilation tube insertion alone or in combination with myringotomy. [13] Charachon stage II and III are open to more debate. Blaney at al. advocates on operation on all stage III retractions and symptomatic stage II retractions.

Table 2. Treatment options for tympanic membrane retraction pockets

Pars Tensa retractions	Attic retractions
Watch and wait	Wait & Watch
Medical treatment	Medical treatment
Ventilation tube insertion	Atticotomy/ tympanoplasty
Excision of retraction ± ventilation tube insertion	
Tympanoplasty procedures with augmentation of tympanic membrane	
Cortical mastoidectomy	
Mastoid venting	

Whatever surgical modality is undertaken for the retractions, the main outcome to be analysed are the recurrence of the retraction, dry ear rate and change in hearing. Various techniques and materials have been employed to treat retracted TMs.[14] Successful reinforcement of the retraction pocket following tympanoplasty is expected in 50–80 % of cases dependant on the severity of the retraction, irrespective of technique or material used.[15]

The aim of the present study is to evaluate our experience with the surgical management of TM retractions using cartilage tympanoplasty augmented with temporalis fascia. We operate only on early symptomatic Charachon stage II tympanic retractions without otorrhoea, keratin debris or choleasteatoma (inactive squamous COM). They had otalgia and hearing loss as symptoms. Generally these patients are kept under wait and watch and not indicated for surgery until they start developing foul smelling discharge or develop choleasteatoma. This strategy may be suitable for developed country but not suitable in underdeveloped country like ours. Keeping these patients under wait and watch make them susceptible for life threatening intracranial and intratemporal complications with high mortality and morbidity. Patients may ignore the disease or

may come very late. People here do not bother about hearing loss because they are not going to die because of hearing loss. Once there is choleasteatoma or intracranial/extracranial complications, these patients need more extensive mastoid surgery under general anaesthesia with more chances of surgical complications. The augmentation cartilage tympanoplasty is relatively simple take less operative time,less extensive, can be done under local anaesthesia. and with fewer intra-operative and post operative complications. We are thus preventing choleasteatoma, ossicular erosion, intra and extracranial complications including hearing loss.

MATERIALS AND METHOD

This work was started after the approval taken from the instituitional review board, National academy of medical sciences, Bir hospital and the criteria set out by the declaration of Helsinki (2008) was fulfilled. Twenty five consecutive patients above 5 years of age who fulfilled the inclusion criteria and undergoing primary cartilage augmentation tympanoplasty over a period of three years starting from July 2017 to Dec.2020 were taken after written and verbal consent (convenient sampling). Tympanic retractions pocket of early symptomatic charachon stage II without otorrhoea, keratin debris or cholesteatoma were selected after history taking and careful otoscopy. A few cases required examination of tympanic membrane under microscope to conform the diagnosis.Patients having retraction pocket of Charachon symptomatic stage III or stage I, Patients having retraction pockets of Charachon stage II with recurrent otorrhoea or keratin debris or choleateatoma, age below 5 years and revision or recurrent cases were excluded from the study. Patients under 5 years of age were not taken because of unreliability and difficulty in assessment of hearing in pure tone audiometry. They had otalgia and hearing loss as a symptom. Pre-operative imaging was not done in any of those cases. Pure tone audiogram was recorded before and 3 months after the surgery in a sound proof room by a trained audiologist. (Audiometer used was amploid 462). The difference of air bone gap (ABG) pre and post surgery was calculated for the measurement of hearing outcome. Four frequencies (500, 1000, 2000 and 3000 HZ) were taken to calculate pure tone average according to American Academy of Otolaryngology-Head & Neck Surgery (AAO-HNS) guidelines. Assessment of graft uptake (successful uptake, retraction(recurrence), residual perforation and otorrhoea) was also recorded at 12th week after operation and every three monthly thereafter. The mean follow up period ranged 3-18 months. All the operations were carried out by the senior surgeon under local anesthesia with discounted surgery charge. Most of the patients were under health insurance scheme and didn't have to pay any charge for the surgery and medicines. General anesthesia was used only in case of children and apprehensive patients. Data was analyzed using SPSS version 21 software.

Surgery detail

Surgical intervention in the form of augmented cartilage tympanoplasty with reinforcement of the retracted segment was carried out in all cases via permeatal or endaural approach. Canal incision was given from 1 o'clock to 7 o'clock position about 6mm lateral to the tympanic membrane. Tympanomeatal flap was elevated. Retraction pocket was carefully elevated from the promontory or the attic. Middle ear was exposed as far as possible to look for cholesteatoma. Ear ossicles checked for mobility and discontinuity. The retraction pocket of TM was excised completely. Disease in the middle ear was cleared completely. The facial recess was exposed and the sinus tympani were inspected for disease if any with an endoscope and it was cleared if necessary. Cartilage was harvested either from the tragus or concha with intact perichondrium at least on one side. Temporalis fascia was also harvested. Removed piece of cartilage was thinned out and shaped appropriately. Once the middle ear was inspected and disease cleared, middle ear cavity was packed with gelatin sponge to support the graft. The harvested cartilage was placed over the incus if present. A temporalis fascia graft was placed over the cartilage and under the handle of malleus. Separate cartilage pieces were placed in the different areas of retraction, if there were more than one retraction pocket. For example, one cartilage piece was placed in the attic and another in the posterior–superior quadrant. If the long process of the incus was eroded, it was removed and interposition ossiculoplasty was carried out. Tympanomeatal flap was reposited then and external auditory canal loosely packed

with Neosporin impregnated ribbon gauze. Mastoid dressing was applied after the surgery. Patient was discharged on the same day after 4 hour of rest in the ENT ward if operated under local anesthesia. All patients were prescribed with oral flucloxacillin, fexofenadine for 7 days and paracetamol SOS according to body weight. Patients were called for follow up on 1st, 6th and 12th weeks of post operation and every three monthly thereafter. All operated patients were intended to be followed up for lifelong if possible and advised accordingly.

RESULTS

The following demographic and clinical observations were made in this prospective, interventional study. Most of the patients (44%) were under 15 years of age. This might be due to poor eustachian tube function leading to retraction of tympanic membrane in this age group.

Table 3. Age distribution

Age	5-15 years	16-40 years	41-65 years	>66 years
Number of patients	11(44%)	5	6	3

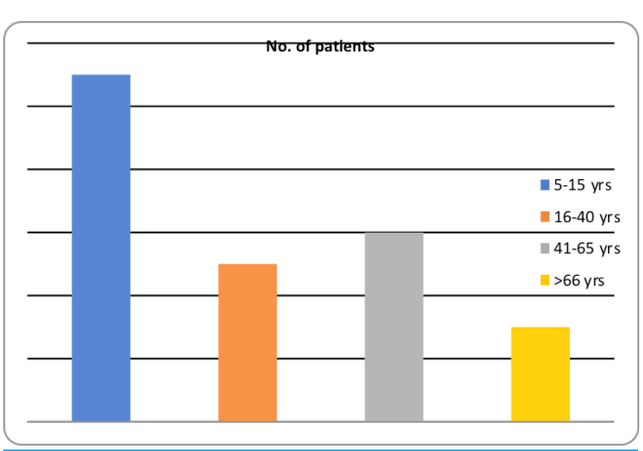

Figure I: Age distribution

Table 4. Sex distribution.

Variables	Male	Female	Total
Number of patients	13	12	25

23(92%) out of 25 patients had successful graft uptake up to one and half year observation period. One (4%) had small residual perforation without otorrhoea and one (4%) had mild retraction at postero-superior region with complete visualization of fundus wihtout accumulation of keratin debris.

Table V: Graft uptake

Graft uptake without perforation and retraction(success)	Residual perforation	Re- retraction
23(92%)	1(4%)	1(4%)

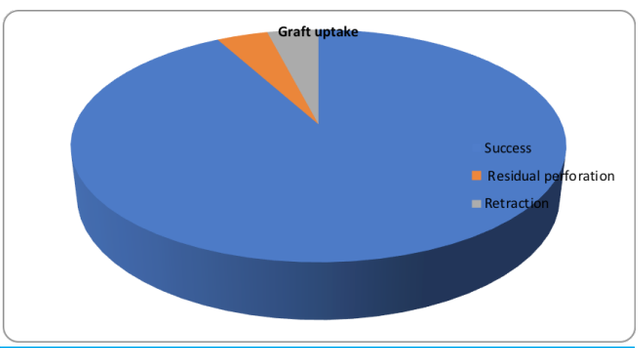

Figure II: Graft uptake

Out of 25 patients, 12 patients (48%) have improvement of hearing 3 months after the surgery. 10 patients (40%) did not have any change in hearing. Only 3 patients (12%) had mild deterioration of hearing.

Table 5. Overall Change in Air Bone Gap (ABG) following surgery

Better (improvement of hearing)	Same(no improvement of hearing)	Worse (mild deterioration of hearing)
12(48%)	10(40%)	3(12%)

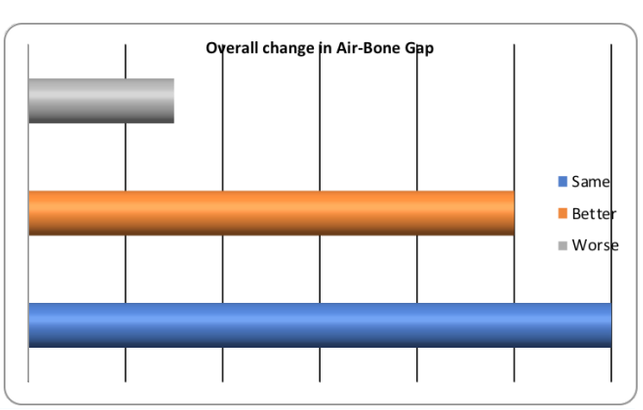

Figure III: Overall change in air-bone gap following surgery

DISCUSSION

In this present study, 23(92%) out of 25 patients had successful graft uptake in eighteen months observation period. One (4%) had small residual perforation without otorrhoea and one (4%)

had mild retraction at postero-superior region with complete visualization of fundus.Out of 25 patients, 22 patients had improvement of hearing 3 months after the surgery. Only 3 patients (12%) had mild deterioration of hearing. This indicates that operation on the early symptomatic patients does not have significant hearing loss and recurrence of retraction with advantage of prevention of choleasteatoma and ossicular erosion. Whatever may be the aetiology, once a retraction pocket forms, further deterioration or resolution depends on the persistence of the secretory otitis media and negative pressure in the middle ear cleft.[9] One of the main difficulties in the treatment of retraction is the timing of the surgical intervention. This largely depends on the progression of the retraction and the consequent symptomatology. Early recognition and monitoring with the judicious use of surgical intervention is therefore vital. Asymptomatic, self cleansing retractions where the full extent is visible can be managed conservatively but once it starts having pain and hearing loss, surgical intervention is the better option to prevent complications and to minimize extent of surgery later on. However, surgical treatment is certainly required in that retractions where the full extent is not visible, persistent or intermittent otorrhoea and obvious keratin accumulation.

In one study of 41 patients by Anand V et al. between 2001 and 2010, twenty six (62 %) ears were Charachon stage II and 16 (38 %) were Charachon stage III retractions. At surgery 35 (83 %) ears had ossicular erosion and cholesteatoma was found in 13 (31 %) ears all of whom had stage III retraction pockets. We didn't find choleasteatoma incidentally even in a single case. If cholesteatoma had been found incidentally, every effort would be made to clear all the disease. Otherwise the surgery would be postponed or formal mastoid surgery would be undertaken under general anaesthesia. This clearly indicates that if we operate late till development of symptomatic stage ii or stage iii retraction, there will be significant damage to middle ear ossicles and formation of choleasteatoma. There were a total of three patients (7 %) with complications. Of these, one patient had a re-retraction a year later, another a recurrent cholesteatoma 18 months following surgery, and a third patient had ongoing otorrhoea 6 months later. All complications occurred in stage III retractions. 35 out of 43 (83 %) ears. In Anand V et al study, follow up postoperatively ranged from 12 to 104 months (mean 38 months). But we followed up to 18 months only in our study so that we might have missed recurrence of tympanic retraction. A high ossicular erosion rate coupled with the high cholesteatoma rate supports early, aggressive management of symptomatic or uncontrollable retractions.[16]

Sade et al. found that in both pars tensa and pars flaccida regions, 2 % of untreated retractions developed cholesteatoma during an average 3 year follow up period.[6] Similar rates of cholesteatoma between 1 and 4 % were reported by Kokko and Tos[17]. The TM should be reconstructed with a material that has greater strength than temporalis facia and for this reason the use of cartilage is advocated. Cartilage has been used as an effective graft material for nearly 50 years. A number of studies have demonstrated its resilience to retraction without affecting hearing.[18] A significant disadvantage with using cartilage is that it obscures keratin pearls behind the graft. Dornhoffer compared the hearing results of patients after cartilage perichondrial grafting versus perichondrium alone and found no statistical difference. He concluded that cartilage tympanoplasty offers the possibility of a rigorous TM reconstruction with excellent postoperative hearing results.[19]

The high rate of cholesteatoma and ossicular erosion found intra-operatively in stage III retractions advocates early surgical intervention before development of complications.

CONCLUSION

Augmented cartilage tympanoplasty operation on the early symptomatic patients of charachon stage II retraction pockets does not have significant hearing loss and recurrence of retraction with advantage of prevention of choleasteatoma formation and prevention of ossicular erosion.

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