



## Tympanoplasty-5 Golden Rules For 100% Success in Terms of Graft Uptake and Hearing Improvement

### KEYWORDS

Tympanoplasty, Postauricular incision, Temporalis fascia, Underlay grafting, anterior window, Exteriorization of handle of malleus.

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**ABSTRACT** Aim: The purpose of this study is to propose concepts for 100% success rate in graft uptake and hearing improvement.

**Materials and Methods:** This is a clinical retrospective study of 1050 patients of chronic suppurative otitis media over a period of nine years. Surgical management of Chronic Suppurative Otitis Media has undergone lot of changes and recent developments.

The management of dry central perforation is by Type I Tympanoplasty.

The 5 Golden rules for 100% success rate in Type I Tympanoplasty are

- Post auricular incision.
- Temporalis fascia.
- Underlay grafting.
- Exteriorization of handle of malleus.
- Anterior window.

**Results:** Temporalis fascia has been accepted as an universal graft material after discarding lot of others. Underlay grafting, Exteriorization of handle of malleus and anterior window creation in all cases of Type I Tympanoplasty over the last nine years of our experience in 1050 cases of dry central perforation have lead to 98% in terms of graft uptake and near normal levels of hearing in terms of hearing improvement. No differences in success rates were observed due to changes in size and site of perforation when these steps were followed in all cases.

**Conclusion:** Harvesting temporalis fascia by postauricular incision and doing the entire procedure postauricularly with placement of temporalis fascia all over the bony sulcus under the annulus with underlay grafting and exteriorization of handle of malleus and supporting it with gel foam in middle ear along with stabilization of the graft anteriorly by pulling it through the anterior window optimizes the results and prevents failures.

### INTRODUCTION:

Chronic otitis media is an inflammatory process of mucoperiosteal lining of middle ear cleft. Infection of middle ear is a troublesome problem even today with devastating complication of hearing loss in the modern era of smart phones and it is more common in rural areas. It is observed that incidence of chronic otitis media is more in Indian population compared to west according to a survey and also there is a general lack of awareness among the people in India. Usually it is more common in children of age group 1 to 5. CSOM usually occurs as sequelae of unresolved otitis media, trauma and iatrogenic causes. Majority of perforations that occur due to trauma heal spontaneously.

The surgical treatment of a non healing non discharging permanent perforation of tympanic membrane is by Type I Tympanoplasty. It was started and developed by Wullstein and Zollner. The main purpose of the operation is not only to close perforation, but to obtain dry safe ear along with hearing improvement. Type I Tympanoplasty with Simple Mastoidectomy is indicated in cases where there is active discharge at the time of surgery in spite of antibiotic treat-

ment.

Our study proposes that with constant practice of single technique involving steps such as post auricular approach, underlay grafting of temporalis fascia, anterior tucking of graft and exteriorization of handle of malleus in all cases of dry central perforations, we could achieve a success rate of good serviceable hearing improvement in 85% of cases and graft take up of 98% of cases.

### MATERIALS AND METHODS:

This retrospective study analyses records of 1050 patients operated by a single surgeon in a teaching hospital setting over a period of nine years.

### INCLUSION CRITERIA:

- Age group 16 to 80 years.
- Safe type of CSOM .
- Patients having conductive hearing loss less than 45dB.

### EXCLUSION CRITERIA:

- Unsafe type of CSOM
- Sensorineural hearing loss

- Hearing loss more than 45 dB loss
- Immunocompromised status

A common proforma was made and details regarding history, general and local examination for each patient were recorded. Routine blood investigations and X ray of mastoids and para nasal sinuses were done. Pure tone audiometry was done for hearing assessment.

Secondary infections were ruled out before planning for surgery. Preoperatively, all the patients were free from discharge for 3 months.

#### PRE OP ASSESSMENT:

Examination of ear, nose, and throat was performed thoroughly with examination under microscope of the affected ears for all cases. Pre op hearing assessment was done with tuning forks of 256, 512 and 1024 Hz respectively along with pure tone audiometry.

Patients are admitted the night before and the surgery was done under LA in all cases except in apprehensive persons. Premedication with 1 tab of diazepam 10mg 1 hr before the procedure, 1 cc of pentazocine and 2 cc of promethazine were given intramuscularly 45 min before starting the procedure.

#### PROCEDURE:

All patients were operated using 1% xylocaine infiltration anaesthesia with 1:80,000 adrenaline. After thoroughly washing the ear canal with betadine and normal saline, endomeatal incisions were given and a laterally based posterior meatal skin flap was elevated. Post auricular incision given and temporalis fascia graft harvested. Soft tissues were separated, the pinna and attached post auricular tissues were reflected anteriorly. Margins of perforation of tympanic membrane were freshened and scrapping of the undersurface of remnant TM was done. Semicircular incisions were given and tymano meatal flap elevated along with skeletonisation of the handle of malleus.

Anterior window created in the anterior meatal skin 1mm lateral to anterior fibrous annulus. Mobility of ossicular chain tested and patency of air pathways established. Underlay grafting of temporalis fascia already harvested, dried and prepared to fit the size, was done after preparing the bed in middle ear with gel foam soaked in antibiotic & steroid ear drops. Exteriorization of handle of malleus was done. Anterior tucking was done by pulling the graft anteriorly through the window made in the anterior canal wall. It was seen that the graft touches all the bony walls of middle ear and sits below the annulus.

Dry pieces of gel foam placed over the graft, followed by few more pieces of gel foam soaked in antibiotic ear drops of broad spectrum nature. Meatal plug placed in external auditory canal. Postauricular wound sutured with 3-0 ethilon. Mastoid dressing applied.

#### POST OPERATIVE CARE:

Antibiotics like Ofloxacin and Tinidazole combinations for a week, routine analgesics for 3 days, and antihistamines for 7 days were given. External dressing changed after 24hrs and the patient was discharged with the advice to be reviewed after 3 weeks.

On 21<sup>st</sup> day the external pack was removed, little gel foam removed and the patient is advised ear drops for 1 week and also advised to prevent entry of water for 3 months

to the operated ear. Follow up was done at 1 month, 3 months, 6 months and 1 year later with assessment of graft uptake and pure tone audiometry done at each visit. Thereafter the patients are followed at yearly intervals for 5 years.

#### RESULTS:

1050 cases of Type I Tympanoplasty were done over the last nine years by the surgeon in all identical pre-op, per-op and post - op protocols.

Surgical success was evaluated in terms of closure of perforation and improvement of hearing. The cumulative percentage of perforation closure is of 98% at the end of 1<sup>st</sup> year, 2<sup>nd</sup> year and 3<sup>rd</sup> year follow up. The hearing results of Type I Tympanoplasty are remarkably stable over 1-3yrs post-operative period. A closure of the air-bone gap to 0-20 db was achieved by 85% of the patients at the end of first year and 89% of the patients after 3 years.

The above results show that by following uniform and standard techniques in Type I Tympanoplasty like postauricular incision, underlay grafting of temporalis fascia, anterior tucking of graft and exteriorization of handle of malleus, we can achieve very good results in terms of closure of perforations and improvement in air-bone gap. 2% of recurrent perforations could be due to otomycosis postoperatively, poor patient self-care, irregular follow up after repeated instructions and dehiscence anteriorly due to small graft in the initial days.

#### DISCUSSION:

The surgical management of CSOM has evolved tremendously from use of various materials and different techniques to a standard procedure aimed at good results. The aims of the surgery have also changed from cessation of the discharge towards a normal neo-tympanic membrane with serviceable hearing. In cases of CSOM, tubotympanic type with non-discharging perforation with an intact ossicular chain, Type I Tympanoplasty is done.

The term Tympanoplasty was first used by Wullstein<sup>[1]</sup> in 1953 to describe the reconstruction of the middle ear hearing mechanism that had been impaired or destroyed by suppurative disease. Type 1 Tympanoplasty is an operative procedure where there is repair of tympanic membrane perforation only, the ossicular chain is intact & mobile and middle ear is disease free.

Glasscock ME3 III<sup>[2]</sup> in 1973 reported a 91% success rate using overlay technique and 96% success rate with underlay technique in a total of 273 cases. We could achieve a success rate of 98% with underlay grafting in 1050 cases with follow up of five years in more than 60% cases. Habib-ur-Rehman et al<sup>[3]</sup> did a study on comparison of outcome of underlay versus overlay grafting. In that study they concluded that underlay technique is simple, easy and achieved good results in terms of graft uptake.

Farhad Mokhtarinejad et al<sup>[4]</sup> in a study of 38 cases found that circumferential sub annular grafting in tympanoplasty yielded good surgical and hearing results of 97%.

P Packer, A Mackendrick and M Solar<sup>[5]</sup> "what's best in myringoplasty; underlay or overlay, dura or fascia? In the study comparison was done between different techniques in 1065 cases and found that graft uptake is 88% in overlay and 92% in underlay technique. Hearing improved in underlay technique, and also concluded that underlay

technique is easier and quicker.

P Hosmani, L Ananth & S B Medikeri<sup>[6]</sup> in a study of 60 patients where 37 patients underwent anterior tucking and 27 patients without anterior tucking showed graft uptake was 96.6% & 81.5% respectively and concluded that anterior tucking of graft material suitable for Anterior and Subtotal perforations.

Prakash Mishra, Nishi.S, Naveen M<sup>[7]</sup> did prospective study of 100 cases of underlay technique with superiorly based circumferential flap and found that graft take up was 97% and hearing gain of 10-30db achieved in 95% cases.

Wehrs and Tulsa<sup>[8]</sup> felt it is necessary to maintain an aerated middle ear space for achieving good hearing result after Type I Tympanoplasty. Although Eustachian tube block, middle ear adhesions, posterior canal wall support dehiscence may be contributing factors for failure of attaining aerated middle ear.

Lot of controversies on the use of graft material, different surgical techniques and varied post op protocols have resulted in lot of confusion and chaos in the minds of otorhinolaryngologists practicing ear surgery. This study has been done to reiterate the importance of standard techniques and protocols in Type I tympanoplasty. All the cases were done with uniform protocols without deviations. Our experience with this series of cases gave very good results anatomically and audiological with an excellent functional outcome.

There are various approaches like transcanal, endaural and post auricular approaches for middle ear surgery. However, postaural approach was only used in all cases.

Postauricular incision is given 3mm behind the retro auricular groove. Bleeding is hardly encountered and even if it occurs, it can easily be controlled with bipolar cautery. This incision gives wide access to middle ear and for canalplasty. Anterior overhang of the bony canal doesn't require attention in all cases of a post auricular approach except very rarely. The temporalis fascia graft can be harvested through the same incision. Mastoidectomy can also be performed if required. There are no disadvantages except a scar which is rarely visible after one year.

Since the times people started attempting closing perforations of tympanic membrane, lot of materials came into existence like dura, skin, perichondrium and vein graft etc. Heermann started using temporalis fascia in 1958. To date, the most widely used grafting material is temporalis fascia only. Regardless of the technique employed, uptake rates are commonly reported at 93 to 97%. It has the advantages of availability in the same area, abundance of availability and very low metabolic rate. It can be easily harvested in a revision case also with a little extension of the incision if required.

The advantages of underlay grafting cannot be overemphasized as much discussion has been made of it in the available literature. Started by Shea and popularized by Glasscock internationally the greatest advantage is prevention of lateralization of neo tympanic membrane with anterior canal blunting and good improvement in hearing results. There have been lot of variations in the underlay grafting for different perforations like antero superior, antero inferior and subtotal perforations. But we used a single technique in all cases irrespective of the size and position

of perforation. Constant technique of underlay grafting in all of our cases has given us good results in all cases in terms of uptake of graft over the last 9 years. In the hands of an average surgeon this postauricular underlay Type I Tympanoplasty yields superior results with almost no complications.

Exteriorization of handle of malleus is supported by double breasting of graft around handle of malleus in all cases of Type I Tympanoplasty which prevents the lateralization of graft and pulls the medialised malleus laterally in post-op period after healing.

Anterior tucking of graft is another important measure in all cases. It was used in all cases, although some senior authors have stated that it is not required in cases of posteriorly located central perforations. This technique stabilizes the graft. Placing the temporalis fascia all over the bony sulcus and meatal wall, supporting it with gel foam in middle ear and stabilizing the graft anteriorly by pulling it through the anterior window optimizes the results and prevents failures

By following the above technique in all cases of dry central perforations, one can achieve a good success rate of 98-100% in early days of starting the middle ear surgery.

## CONCLUSIONS:

One can achieve a very good success rate in management of Chronic Suppurative Otitis Media with dry central perforation by constantly practicing a single technique with good pre-op preparation. Placing the temporalis fascia all over the bony sulcus with underlay grafting, exteriorization of handle of malleus, supporting it with gel foam in middle ear and stabilizing the graft anteriorly by pulling it through the anterior window optimizes the results and prevents failures. In an era of increasing number of techniques by individual surgeons with no proper follow up we have done this study to emphasize the importance of standard good old techniques to trash the confusion among the minds of young otorhinolaryngological surgeon.

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