



## Original Research Article

## A clinical study on 50 cases of myringoplasty using tragal cartilage with / without perichondrium graft material

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## ARTICLE INFO

## Article history:

Received 02-01-2020

Accepted 22-01-2020

Available online 16-08-2020

## Keywords:

Chronic otitis media

Myringoplasty

Tragal cartilage

Perichondrium

## ABSTRACT

Myringoplasty and tympanoplasty are descriptive term defining surgical procedure that address pathology of the tympanic membrane and middle ear. Myringoplasty is an operative procedure used in reconstruction of a perforation of tympanic membrane. This assumes that the middle ear space, its mucosa, and the ossicular chain are free of active infection. There is no direct inspection of the middle ear during this procedure implying that the TM is not elevated from its sulcus. Tympanoplasty implies reconstruction of the tympanic membrane but also deals with pathology within the middle ear cleft, such as chronic infection, cholesteatoma, or an ossicular chain problem. To distinguish these two terms further, Rizer (1997) defines tympanoplasty to include all procedures in which "the drum is lifted from its position in the ear canal." Subsequent additional procedures such as grafting the tympanic membrane, alone, or in combination with ossiculoplasty (tympanoplasty with ossicular chain reconstruction), comprise the varying

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### 1. Introduction

Myringoplasty and tympanoplasty are descriptive terms defining surgical procedures that address pathology of the tympanic membrane (TM) and middle ear. Myringoplasty is an operative procedure used in the reconstruction of a perforation of the tympanic membrane. This assumes that the middle ear space, its mucosa, and the ossicular chain are free of active infection. There is no direct inspection of the middle ear during this procedure implying that the TM is not elevated from its sulcus. Tympanoplasty implies reconstruction of the tympanic membrane but also deals with pathology within the middle ear cleft, such as chronic infection, cholesteatoma, or an ossicular chain problem. To distinguish these two terms further, Rizer (1997) defines tympanoplasty to include all procedures in which "the drum is lifted from its position in the ear canal." Subsequent additional procedures such as grafting the tympanic membrane, alone, or in combination with ossiculoplasty (tympanoplasty with ossicular chain reconstruction), comprise the varying

subtypes of tympanoplasty.<sup>1-5</sup>

Banzer (1640) described the first attempt at repair of a TM perforation with a pig's bladder. Toynebee [1853] placed a rubber disk attached to a silver wire over perforation.

Yearsley (1863) placed a cotton ball over a perforation. Blake [1877] proposed the paper patch which is still used today for preoperative evaluation. Chemical cautery was performed by Roosa (1876) and Okneuff (1895). The term myringoplasty was coined by Berthold in 1878. He placed a thick skin graft.<sup>6-8</sup>

Wullstein and Zollner [1950] are given credit for ushering in the modern era of tympanoplasty. They placed split thickness skin grafts over the de-epithelialized TM remnant. Wullstein (1956) described five types of tympanoplasty based on the relationship of the grafted TM to the middle ear structures. Storrs [1961] reported a series of patients in which temporalis fascia was used as an outer surface graft.

Past three decades temporal fascia has been the most commonly used grafting material in tympanoplasty.<sup>9,10</sup>

Cartilage was first used in middle ear surgery for ossicular chain reconstruction in 1958 by Jansen. In 1963, Salen and Jansen first reported the use of cartilage composite grafts for tympanic membrane

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reconstruction. Over the past twenty years autologous cartilage-perichondrium grafts have come into use to prevent recurrence retraction pockets and cholesteatomas in patients with Eustachian tube dysfunction. Cartilage is also reduce the rate of extrusion thought to of prostheses used for ossicular chain reconstruction. Cartilage grafts are usually used in combination with temporalis fascia grafts and are most successful when placed posterosuperiorly and in the area of the posterior pars flaccida (Poe and Gadre, 1993). Cartilage has also been used to graft the entire TM (Domhoffer, 1997]

The present study has been aimed to utilize the tragal cartilage perichondrial composite graft.

## 2. Aims and Objectives

1. Closure of tympanic membrane to prevent recurrence infection and cochlear loss
2. To improve the hearing status
3. Fitness for various services like military, telephone deptt Etc
4. In cases of S.N. hearing loss closure of tympanic membrane is helpful for wearing hearing aids

## 3. Materials and Methods

The present study was done on patients who visited the out patient department of Otorhinolaryngology of MBS Hospital, Kota. The study was carried out of 50 patients of different age (12-48years) and sex group. The cases selected for this study was carried out clinical examination including examination under microscope. The criteria for selection of these patients included dry ear for a period of 1 month. Intact and functioning ossicular chain, tested by paper patch test patent E. tube and absence of any other pathology like cholesteotoma and granulations.

Patients were operated upon to improve hearing and prevent recurrent infection. The method of study was carried out under the following heading:

1. History taking
2. Clinical examination
3. Investigations
4. Operative procedures
5. Follow up

### 3.1. History taking

#### 3.1.1. Complaints

- Ear discharge and its duration - tinnitus - Type of discharge and amount

Decrease hearing

Pain or discomfort in ear - recurrent URI

Vertigo

### 3.2. History of present illness

- The onset - duration

- Progress of discharge and discharge free period was specially indicated

### 3.3. Personal history

- Points in relation to occupation and habits were noted

### 3.4. Past history

- This was enquired in relation to ear discharge, otalgia, sorethroat, colds, allergy, infectious fevers such as measles, typhoid chickenpox etc.

### 3.5. Family history

- Any relevant illness was looked for

### 3.6. Clinical examination

1. Was carried out with thorough ear, nose and throat exam was performed
2. The appearance of pinna and external auditory canal was examined
3. The TM examined for its integrity, landmarks, contour and mobility. The size, site and appearance of edge of perforation were noted. The condition of middle ear
4. Mucosa through perforation was particularly looked for further the ears were subjected to thorough examination under magnification using Ziess operating microscope.
5. Preoperative hearing level was evaluated by tests using tuning forks of variable frequencies i.e. 256, 512, 1024. Conversation and whisper voice and puretone audiometry was performed in all cases.
6. By anterior rhinoscopy examination position of the septum, condition of nasal mucous membrane, amount of nasal airway, presence of any discharge, any polypoidal mass. The size of turbinate's were particularly looked for, the posterior choana, E-tube orifices were inspected with posterior rhinoscopy.
7. Paper patch test was done with all cases to see the integrity of Tympanic membrane.
8. Paper Patch test :- Perforation is closed with the cigarette paper pre and post operative audiogram are compared If the hearing is improved. It is known as Positive paper patch test. It indicate integrity of the ossicular chain.

### 3.7. Investigations

A radiological examination of both mastoids lateral- oblique views Pure tone audiometry to find out preoperative hearing levels prior to undertaking the patients for surgery.

E- tube function test : the E-tubal functions were evaluated in each case by valsalva's manoeuvre.

### 3.8. Valsalva's manoeuvre:

The external auditory canal and middle ear was cleaned of any debris and wax. Then the patients was asked to take a deep breath keeping the nose tightly SEM pinched and the lips firmly closed and then forcibly attempt to blow the nose rustling, hissing or blowing sounds if heard was noted. In cases where it was doubtful a rubber tube was connected to the patient ear under observation and the other end was put into the observer ears so that if there was any sound it was noted

### 3.9. Operative techniques

Graft material: In 50 cases of tragal perichondrium or cartilage with perichondrium was used as a graft material for myringoplasty.

### 3.10. Tragal perichondrium graft

After injecting local anaesthesia using adrenaline with xylocaine 2% in the ratio of 1 :200000.

A incision is made over tragal margin and skin flaps along with subcutaneous tissue are elevated tragal cartilage is exposed and excised out with perichondrium attached to it. The perichondrium is elevated under magnification and the cartilage is replaced back in its position and the skin sutured. The perichondrial graft so obtained is used for myringo plasty.

### 3.11. Technique

1. Inlay,
2. Onlay
3. Interlay

### 3.12. Onlay Technique

The operation were performed by transmeatal approach under ziesse operative microscope. The meatal skin cuff was incised long the tympano mastoid suture line inferiorly. Then it was elevated and the epithelium was stripped from any anterior or inferior drum remnant and averted a continuity with the deep metal skin, when it was fully dissected, the erichondrium or cartilage with perichondrium was spread over the prepared surface of the TM. Where only a narrow rim of membrane removed the crichondrium was extended for several mm beyond the annulus on to the adjacent meatal wall. Meatal skin flaps were now replaced to overlap the largins of the overlap the margins of the perichondrium graft. Then it was packed with antibiotic and steroid packing and bandaged.

### 3.13. Inlay Technique

In "inlay" technique (Haugh, 1970) or an "underlay" echnique (shea, 1960). The rim of the perforation is removed and the subjacent mucosa is slightly scerified. Then perichondrium supported within the tympanum by gel foam is fitted under the malleus handle and any anterior drum remnant to reach the posterior meatal wall where it is covered by a previously elevated meatal skin flap. Apparently the mucosa of the TM grows around. and underneath the facia so that it becomes part of the TM. 51

After care: Antibiotic cover was provided for 7 days. The pack was removed not before 7 days. Follow up was carried at one week, two and three weeks, 1 month and 3 months. out in the following manner.

- Condition of the graft
- Level of hearing by (i tuning fork test, (ii audiometry

## 4. Observations

**Table 1:** Age wise distribution of patients

Age in Years	Number of patients	Percentage of Patients
0-10	0	0
11-20	11	22
21-30	19	38
31-40	14	28
41-50	6	12

Total cases 50. Minimum age 12 year. Maximum age 50 years. Maximum number of cases were adults between 11 to 30 years.

**Table 2:** Sex wise distribution of patients

Sex	Number of patients	Percentage of Patients
Male	20	40
Female	30	60

Male and female ratio 1:15

**Table 3:** Distribution of patients according to Involvement of Ear

Ear involved	Number of patients	Percentage of Patients
Right	16	32
Left	26	52
Both	8	16

Total Number of cases 50, Majority of cases had pathology in left ear.

## 5. Discussion

The Present study was conducted on 50 cases of CSOM with dry central perforation selected for myringoplasty in

**Table 4:** Distribution to patients according to occupation

Nature of work	Number of patients	Percentage of Patients
Student	5	10
House wife	21	42
Business man	8	16
Service man	12	24
Labour	4	8

Total case 50. Maximum number of cases were from middle class group house wife. 45

**Table 5:** Distribution of patients according to duration of complaints.

Complaints	Duration							
	3-6 mths	%	7-12 mths	%	1-2 years	%	3-5 years	%
Discharge	18	36	24	48	6	12	2	4
Hearing loss	16	32	22	44	8	16	4	8
Otalgia	4	8	2	4	0	0	0	0
Rec. URI	4	8	2	4	0	0	0	0

Total case 50. It was observed that all the cases had Diminished hearing and discharging ear off and on.

**Table 6:** Distribution of patients according to the area of T.M. involved

Quadrant of T.M. Involved	Number of Percentage	Percentage of Patients
Antero- inferior	3	6
Postero- inferior	7	14
Sub- total	12	24
Centrally Situated	28	56

Total case 50. It was observed that 56 % of the cases were of central perforation.

**Table 7:** Distribution of patients according to the size of perforation

Quadrant of T.M.	Number of Patients	Percentage of Patients
One Quadrant	11	22
Two Quadrant	13	26
Three Quadrant	14	28
Sub Total	12	24

Total case 50. Maximum number of cases in which Three Quadrant of T.M. Involved.

**Table 8:** No. of Patients with completed healed perforation at 1 year follow up.

Duration	Number of Patients	Percentage of Patients
At 3 months	50	100
At 6 months	48	96
At 1 year	47	94

Total case 50. At 3 month duration 100% cases completely healed.

**Table 9:** Distribution of patients according to pre operative A-B Gap

Degree of hearing loss	Pre operative A-B Gap	Number of patients	Percentage of patients
I	20-30dB	18	36
II	30-40dB	27	54
III	Above 40 dB	5	10

Total case 50. Maximum number of cases had hearing loss of 30-40 dB. 60

**Table 10:** Surgical Technique used

Surgical Technique	No. Patients	Percentage
Inlay	50	100
Onlay	0	0
Interlay	0	0

Total case 50. All the cases inlay technique used. No. Patients

**Table 11:** Distribution of patients according to mastoid cellularity (Study of X-ray Mastoid)

Type of Skiagram	Number of Patients	% of Patients	Acceptency of Graft			
			Healed	%	Rejectd	%
Cellular	20	40	20	100	Nil	0
Hypo Cellular	28	56	27	98	1	0
Sclerosed	2	4	Nil	0	2	0

Total case 50. 40% of cases had cellular mastoid.

**Table 12:** Graft Material Used

Graft Material	Number of Patients	Percentage
Tragal Cartilage alone	17	34
Cartilage with perichondrium (Composite Graft)	33	66

Total case 50. 66% of cases composite graft used.

**Table 13:** Graft material used and their result at 1 year

Graft material	No. of Patients	%	Acceptance	%	Rejected	%
Tragal cartilage	17	34	17	100	0	0
Cartilage with perichondrium (Composite Graft)	33	66	30	30	3	10

Total case 50. 34% of cases Tragal cartilage was fully accepted.

**Table 14:** Distribution of patients according to the closure of A-B gap at 1 month

Hearing gain in dB	No. of Patients	%
30 dB or above	9	18
21-30 dB	16	36
11-20 dB	19	38
1-10 dB	6	12
No gain	0	0

Total case 50. 38 9% of cases closure of A-B gap at 1 month.

**Table 15:** Distribution of patients according to closure of A-B gap at 3 months No. of Patients 16 28

Hearing gain in dB	No. of Patients
0-10 dB	6
10-20dB	16
30-40 dB	28

Total case 50. 28 patients A-B closure gap at 3 month is 30-40 dB.

**Table 16:** Hearing improvement at 1 year

Hearing gain in dB	No. of patients
No gain	3
0-10 dB	3
0-10 dB	19
0-10 dB	25

Total case 50. 25patients hearing improvement at 1 year is 30-40 dB.

**Table 17:** Distribution of patients according to Residual Hearing loss at 1 year

Hearing gain in dB	No. of Patients
0-10 dB	2
10-20dB	6
30-40 dB	Nil

Total case 50. 6 patients had residual hearing loss of 10-db

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The 1<sup>st</sup> table shows that the maximum incidence in these cases were in the age group of 12-30 years (60%) followed by 31-40 years age group (28%). Minimum age in our study was 12 years and maximum was 50 years. We have not operated any case below 12 year of age. Since it is the age of recurrent adenoiditis and upper respiratory tract infections, which can be a cause of failure in simple myringoplasties, this correspond to the studies done by Singh & Bhaskar (1972) and Gupta AK. (1972). Where the maximum number of cases were also in the age group 25-35 years.

The 2<sup>nd</sup> table shows the sex distribution of these cases in the present study with the male female ratio of 1:1.5 respectively. This explains that females were more worried about that hearing and recurrent discharge from ears. Because of Social stigma associated. Therefore they came forward for operative procedure and to improve hearing.

The 3<sup>rd</sup> table shows that the left ear was predominantly involved in the involved only in 32% both ears Present series i.e. 52 % while right ear was involved in 16% of cases.

The 4<sup>th</sup> table shows that the maximum number of cases were house wives 42% followed by service class i.e. 24 % labourer class (8%). This can be explained by the fact that ladies and educated members came forward for getting hearing improvement. Uneducated or labourer came only when there was severe hearing loss, thus we can say that education play a great role in seeking early advise regarding disease and treatment. This study is similar to Gupta J.P. (1978), in his study the maximum number of cases were house wives 63% and students (23.4%) and minimum (13.3%) cases were in labour group

The table number 5<sup>th</sup> indicates the distribution of cases according to duration of complaints. In 48 cases (96%) the duration of discharge was more than one year and ranging up to 3-5 years. Similarly hearing loss was present in all these cases. The longer the duration more was the hearing loss. Hence the results were not as good as in the cases of short history. Four cases had also complaints of Otolgia that can be explained due to associated acute upper respiratory tract infection.

The 6<sup>th</sup> table shows the involvement of the quadrant of tympanic membrane in perforation. Most cases (56%) were of central perforation only in 2 cases (24%) sub total perforation was present. For this study small central perforation cases were good and satisfactory results were obtained. anteroinferiorly placed perforation (below the handle of malleus) were selected only for putting cartilage with perichondrium. Keeping in mind that this could not disturb the ossicular chain. Posteriorly placed perforation were not selected for putting the cartilage with perichondrium graft to avoid ossicular chain disruption. This study is similar to the Gupta J.P. (1978). In this study the large central perforation was (63,40%) and small central perforation in 36.6% cases.

The 7<sup>th</sup> table shows that the distribution of patients according to the size of perforation is maximum in three quadrant (28%6) of TM. involved. Two quadrant of T.M. involved in (26%) cases. And One quadrant of T.M. involved in (22%). Sub total perforation occurs in (24 %) cases.

The 8<sup>th</sup> table shows that (100 %) of cases at 3 month duration as completely healed. (96%) of cases healed at 6 months duration. (94%6) cases healed at 1 year duration.

In 9 table shows that the maximum number of cases had hearing loss of 30-40 dB i.e. 27 cases (54%) followed by 20-30 dB hearing loss in (36%) cases, while more than 40 dB hearing loss was present only in five (5) cases. This hearing loss can be explained by the size of perforation patients with ossicular discontinuity were excluded from the study.

The 10<sup>th</sup> table shows that inlay technique was used in all cases i.e. 100 The result of inlay technique were excellent in the present series with only three failure, so we can that inlay technique stands superior to onlay and interlay techniques.

The 11<sup>th</sup> table revealed the radiological features of middle ear cleft. In (40%) cases mastoids were cellular, (56%) mastoids were hypo cellular while only in (4%) cases had sclerosed mastoid. This indicates that disease was limited only upto the middle ear not extending to antrum aditus and epitympanum. This study is similar to Gupta J.P. (1978). In his study (4076) mastoids were cellular while (60%) were hypo cellular.

The 12<sup>th</sup> table shows that in most of the cases tragal cartilage with perichondrium (composite graft) was used as a graft material from the patients himself (66%), followed by cartilage alone i.e. (34%) cases.

The 13<sup>th</sup> table shows that out of 17 cases done using tragal cartilage as a graft, in all 17 cases graft material remained healthy till complete healing Out of 33 cases where cartilage with perichondrium was used ended with satisfactory graft take up and bearing, while in 3 cases the graft was not accepted due to infection.

The 14<sup>th</sup> table shows the postoperative hearing gain in dB. The maximum SEM hearing gain was 11-20 dB or above which was in 19 cases i.e. (36%) while 21- 30 dB hearing gain was seen in 16 case (32%) and 10 dB gain found in 6 cases ie. (12%). No hearing improvement seen in 3 cases which included the failure Cases. These findings are quite similar to those mentioned by Kacker et al (1974), Ghosh and Mehra (1975) and Kicker (1976) where good hearing was obtained in 71% cases and satisfactory in 17 % cases with no improvement in 12% cases. Good hearing gain was observed in the cases where cartilage was taken as a graft material while satisfactory hearing gain was observed in the cases where cartilage with perichondrium were used as a graft material. We can explain the less hearing gain with cartilage with perichondrium, graft as compared to cartilage which restricts the mobility of tympanic membrane.

The 15<sup>th</sup> table shows that 28 cases shows closure of A-B gap of 30-40 dB. At 3 months duration. 16 cases shows closure of A-B gap 10-20 dB. 6 cases shows closure of A-B gap of 10 dB.

The 16<sup>th</sup> table shows that 25 cases shows hearing improvement at 1 year of 30-40 dB. 19 cases shows hearing improvement of 10-20 dB. 3 cases shows hearing gain of only 10 dB. While 3 cases no hearing improvement occurs at 1 years duration.

The 17<sup>th</sup> table shows that the residual hearing loss of 10-20 dB. In 6 cases and 10 dB residual hearing loss in 2 cases in 1 year duration.

## 6. Conclusion

50 cases of dry central perforation in which myringoplasty was performed using tragal cartilage alone or tragal cartilage with perichondrium were studied. The main point of interest are summarised as follow:

1. That most of the cases were young adults between 21-30 years of age. The male to female ratio being about 1: 15 most of which were middle class house wives.
2. The chief complaints found in all the cases were diminished hearing and discharge from ear on and off. 56% of the cases had central perforation and the ears were dry for over a period of 1 to 3 months.
3. On radiological examination 40% of the cases had cellular mastoid, 56% had hypocellular mastoid and 4% sclerosed. All the cases had normal patent E. tube.
4. All cases inlay graft technique (100% was used)
5. We found that the successful results i.e. taking up of the graft and good hearing achieved in cellular mastoid were 100% while in hypocellular the results achieved were 98%.
6. Out of 50 cases in which myringoplasty was performed (94%) healed completely while in (6%) there was graft failure. When compared with graft material used the success rate was (100%) with tragal cartilage alone and 90% with cartilage with perichondrium. (composite graft) which was used in large central or sub total perforation. In none of the

cases we came across any perichondritis therefore we conclude from our study that tubal function and cellularity of mastoid play a vital role in achieving good results in myringoplasty. Tragal cartilage and cartilage with perichondrium (composite graft) used as graft material gave good results in the present series.

## 7. Source of Funding

None.

## 8. Conflict of Interest

None.

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**Cite this article:** Verma RK, Nagar J. A clinical study on 50 cases of myringoplasty using tragal cartilage with / without perichondrium graft material. *IP J Otorhinolaryngol Allied Sci* 2020;3(2):46-52.