



Research Article

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Assessment of hearing improvement by myringoplasty

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Abstract

Myringoplasty means an operation in which the reconstructive procedure is limited to repair of the tympanic membrane perforation. The procedure of Myringoplasty was evolved a century back and since then has progressively improved in its ability to surgically repair the perforation of the tympanic membrane to a high level of accuracy. The present study was done to study the improvement in hearing after Myringoplasty. The present study "Assessment of hearing improvement by Myringoplasty" was carried out with the patients attended the ENT OPD at a tertiary care hospital in South India from 2000 to 2002. Patients attending to ENT OPD with complaints of discharge from the ear and hard of hearing are examined in detail. Patients having hard of hearing, i.e. conductive deafness and a dry perforation were selected. Pre-operative AB gap in small perforation was between 20-30 dB, in majority of moderate central perforation was between 31-40 dB and in subtotal perforation it was between 41-50 dB. Thus we found in our study, that the pre-operative AB gap increased as the size of perforation increased. After myringoplasty operation, the resultant average improvement, i.e., amount of closure of AB gap was 23 dB. In our study, there was no worsening of hearing or sensorineural loss in any case postoperatively. Perforation of the tympanic membrane most commonly arises as a result of otitis media and trauma, usually presenting clinically with conductive hearing loss and recurring otorrhoea. Myringoplasty using the underlay technique with temporalis fascia as graft in an easy technique which gives a high success rate as far as closure of perforation in tympanic membrane and improvement in hearing is concerned with minimal rate of complications.

Keywords: Myringoplasty, Temporalis fascia, Tympanic membrane, Air-bone gap.

Introduction

Chronic suppurative otitis media (CSOM) is one of the most common ear diseases in the developing countries. CSOM is defined as a persistent disease, insidious in onset, often capable of causing severe destruction of middle ear structure and irreversible sequel, which is clinically manifested with deafness and discharge more than 3 months.¹ Myringoplasty, an operation performed to repair or reconstruct the tympanic membrane² was introduced by Berthold³ and was further developed by Wullstein⁴ and Zollner⁵.

The surgeon must be an audiologist, physiologist, plastic surgeon and experimenter if he wants to work in tympanoplastic surgery. Chronic suppurative otitis media (CSOM) is one of the commonest day to day ailment with which patients present to the ENT outpatient department. It results in reduction of academic achievement and disturbances in social and emotional development. In adults, it produces psychosocial complication and affect the quality of individuals daily living activity. They have reduced mobility, fewer interpersonal contacts and it poses a significant economic burden as few deaf people are employed in professional, technical and managerial position.

Closure of these perforations provides a barrier between the external pathogens and middle ear mucosa. It restores the vibrating area of the membrane and thus improves hearing. As hearing loss (deafness) and ear discharge are the commonest symptoms presented in the OPD and where medical management fails, surgical intervention in the form of Myringoplasty is felt necessary to relieve the patient of his complaints and to reduce the enormous degree of morbidity, economics and social disability which affects many people. This problem is significant in our society and any effort directed towards the assistance of those who are afflicted is indeed worthwhile. The present study was done to study the improvement in hearing after Myringoplasty.

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Materials and Methods

The present study "Assessment of hearing improvement by Myringoplasty" was carried out by the patients attended the ENT OPD at a tertiary care hospital in South India from 2000 to 2002.

Patients attending to ENT OPD with complaints of discharge from the ear and hard of hearing are examined in detail. Patients having hard of hearing, i.e. conductive deafness and a dry perforation were selected. For the purpose of study the patients with wet perforation were also selected.

At the beginning detailed clinical study was noted then thorough clinical examination of ear-nose-throat was carried out. The special attention was given to otoscopic examination. Tuning fork tests, audiometry and oto-microscopic examination. The hearing level was recorded with a pure-tone audiometer. The pre-operative audiograms were compared with postoperative audiogram to know the hearing improvement.

The following were the criteria for selection of cases.

1. The perforation is of central type i.e. in pars tensa with intact annulus.
2. The ear should be dry for atleast 4 weeks pre-operatively, although few cases of wet perforation were operated for the purpose of study.
3. The tuning fork tests should show hearing to be longer by bone conduction than air conduction i.e. pure conductive deafness.
4. The audiometry should reveal only conductive deafness ranging from 25dB to 50dB of hearing loss.
5. Adequate cochlear function should be present i.e. good cochlear reserve.
6. The middle ear should be disease free as evidenced by absence of granulation, oedema, hyperaemia or polyp of mucous membrane.
7. The Eustachian tube should be patent.
8. There should be no septic foci in nose, paranasal sinuses or throat.
9. Too young and too old patients with central perforations were not selected for study.
10. The air bone gap in the audiogram should close appreciably after closing the perforation with paper patch.

Myringoplasty was performed using underlay technique. Graft material used – temporalis fascia. Usually 6 weeks after operation, the ear was examined and gel foam pieces were removed gently. If there was no infection and the graft had taken well, Rinne's test was done and audiometry was done to note any improvement in hearing. Thereafter, patients were advised to come for follow up after 3 months, 6 months, and 1 year duration.

Results

A total of 50 cases were included in the study. The age and gender distribution of the cases is shown in table 1 and 2 respectively.

Table 1: Age group of the patients

Age group in years	No. of patients	Percentage
0-10	0	0%
11-20	26	52%
21-30	13	26%
31-40	7	14%
41-50	4	8%
Total	50 cases	100-00%

Table 2: Gender distribution of patients

Sex	No. of patients	Percentage
Male	29	58%
Female	21	42%
Total	50 cases	100.00%

The pre-operative air-bone gap is shown in table 3.

Table 3: Pre-operative air-bone gap

Sex	No. of patients	Percentage
Male	29	58%
Female	21	42%
Total	50 cases	100.00%

The comparison of pre and post operative air bone gap is shown in table 4.

Table 4: Comparison of pre and post operative air bone gap

Air-bone gap in dB	Pre-operative cases	Post-operative cases
0-20	0	38
21-40	21	5
41-50	29	0

The hearing results are shown in table 5.

Table 5: Hearing results

S. No.	Hearing gain dB	No. of cases
1.	<10	2
2.	11-20	13
3.	21-30	23
4.	>30	5

The Mean pre and post operative air conduction is shown in table 6.

Table 6: Mean pre and post operative air conduction

Mean pre-operative Air conduction	Mean post operative Air conduction
52.37 dB	28.83 dB

The mean improvement in air conduction is shown in table 7.

Table 7: Mean improvement in air conduction

S. No.	Air-Bone gap	dB
1.	Average A-B gap pre-operative	38.7
2.	Average AB gap post-operative	15.58
3.	Average improvement (amount of closure of AB gap)	23.12

Discussion

In our study, we have operated 50 cases considering pre-requisites. In this study the age of the patient who underwent surgery varied from 12 years to 50 years. The average age of the patient at the time of operation was about 23.4 years.

In the earlier studies conducted by many authors, as in J. Bennett's series⁶ the average age of the patient was 21.5 years. In J.B Booth's series the youngest was 8 years old and the oldest 67 years, with an average of 33.7 years. This means that, except for very young and very old patients, patients of all age groups were operated. This is because, very young children by the time they seek advice of the specialist, they will have reached this age, very old people are reluctant to get operated.

In our study, the success rate for small and medium sized perforation was 95% and 80% for larger perforations. We found that, smaller and moderate perforations have a better chance of closure than larger perforations. This is probably because of the larger bed is provided for the graft and the graft has better chance to take in cases of small and moderate sized perforations. The results can be compared with that of Alan Gibb and Kiat series.⁷

Regarding the size of perforation and the technique of myringoplasty to be adopted few authors have made a comment. According to Alan Gibb and Kiat⁷, larger perforation was designated as those occupying half or more of the surface area of the tympanic membrane, perforation covering the lesser area being categorized as a small. The size of perforation was considered to be the factor which might influence the technique of operation.

In our study, we utilized underlay technique using temporalis fascia for all cases. The success rate was 95% in cases of small a medium size perforations and 80% for subtotal perforations. Although the success rate is less for larger perforations as compared to small medium sized perforation, the overall results were good as stated by A.Gibb and Kiat⁷, if careful technique is used the success rate is not affected by the size of perforation.

Salah D and Salman⁸ opined that the presence of atrophic areas, scars or calcareous deposits in the tympanic membrane remnant adversely affected the graft take rate. In the series carried out by Alan Gibb and Kiat⁷ in 365 operations, they concluded that graft take rate appeared to be little affected by tympanosclerosis even if the graft is applied directly over it.

About the graft material used, it is now accepted that the connective tissue graft, if used, have the highest take rate and success rate. In our study, we used autogenous temporalis fascia. R.J. Bennet⁶ in his series of 201 type I tympanoplasties, the graft materials used by him to close the defect in tympanic membrane were free full thickness post aural skin graft in 21 patients a temporalis fascia in 180 patients.

The total graft acceptance rate was poor in cases where the skin graft was used and quantitative results of myringoplasty were best with temporalis fascia. S.K.De and A.K. Chatterjee⁹ in their study of 30 cases, argued that temporalis fascia have stood the best of time regarding success rate. Temporalis fascia was used in all cases for its easy availability, availability near the site of operation, sufficient material immunologic inertness, minimum nutrition requirement and quick vascularization and intake. The incidence of graft rejection was seen in 2.5% of cases.

John Mathai¹⁰ in his study of 200 cases of myringoplasty, used temporalis fascia and underlay technique for all cases. He concluded that temporalis fascia is an excellent graft material which gives a high success rate as far as closure of tympanic membrane perforation and improvement of hearing is concerned. In our study, we used temporalis fascia and underlay technique for all cases. Out of 50 cases who underwent myringoplasty operation, 43 were successful, 5 cases were failures and 2 lost follow up. If we consider that the patient who had lost follow – up as failures, our success rate is about 86%.

Regarding the condition or state of hydration of graft not many authors have made a comment. A.Gibb and Kiat S⁷ in their study of 365 cases, showed that percentage of the graft take rate was 88.8% when the graft was moist /fresh, 91.4% when the graft was partially dried and 90% when it was completely dried. The overall analysis showed that the graft take rate was not influenced significantly by the state of hydration of the graft material.

In our study, the majority of cases the graft was allowed to dry, until it resembled parchment and in few cases partially dried. We found that, when the graft material was dried it was somewhat easier to handle and place the graft. The final result was good in all cases and is consistent with views of A.Gibb and Kiat.⁷ Regarding the graft take rate, the results vary according to technique and graft material used. According to various literatures, graft take rate is maximum when temporalis fascia is used.

In R.J Bennett's series⁶, the graft take rate was 93.3% and total failures were 0.55% cases. In A.Gibb and Kiat series⁷ they compared various techniques and grafts used in myringoplasty. Regarding technique used they showed a success rate of 92.3% with sandwich technique, 87.5% with underlay technique, 76% with onlay technique and 75% with plugging technique. Regarding the type of graft material used they showed that the success rate was highest with temporalis fascia 88.2% and vein 77.8% while miscellaneous (fat, connective tissue, periosteum, perichondrium) was 82.6%. In our study, we used only underlay technique and temporalis fascia as graft with success rate of 86% and correlates well with other authors.

About the assessment of hearing various criteria have been used by different authors, like closure of air-bone gap, improvement in hearing to socially adequate level, etc. most of the authors consider that, the improvement in hearing by air conduction to 30 dB or closure of air-bone gap to within 20 dB or less as successful result. In cases where there is no improvement in hearing or deterioration following surgery, the result is considered failure.

B.J.Bennett⁶ in reviewing the post operative hearing of his 85 type I tympanoplasties reports that, 72 cases (84.3%) achieved socially adequate hearing level post operatively. There was marginal improvement in 12 cases (14.1%), one case had post operative worsening of hearing. Packer, M. Solar¹¹ in their study showed that closure of air bone gap was better with underlay technique than overlay technique and also stated that underlay dura was better than underlay fascia. There was no statistically significant difference between the man improvement in air bone gap with dura or fascia. They also showed that achievement of socially acceptable hearing was better with underlay than overlay.

In our study 38 cases (76%) achieved socially adequate hearing level postoperatively, in 5 cases (10%) there was marginal hearing improvement. There was no worsening of hearing in any case postoperatively. Our results are comparable with figures of R.J.Bennett.⁶ There was a mean improvement in air conduction from

52.3dB to 28.8dB with the resultant average improvement amount of closure of air bone gap of 23dB. There was no worsening of hearing in any case post operatively.

In our study only one case revision myringoplasty, the patient had a residual perforation, which after surgery; the defect was closed successfully with good hearing improvement. In our study some cases complained of tinnitus (9 cases – 18%) and giddiness (5 cases -10%) occasionally. Although 1 cases (tinnitus) was failure and 1 patient lost follow-up, remaining patients were symptom free till their last follow-up. This shows that simple closure of the tympanic membrane defect will help the patients with tinnitus and giddiness, in patients without any underlying pathology. In our study the side of ear disease, whether unilateral or bilateral didn't affect much on the outcome of surgery. The success rate was 89.4% with unilateral diseased ears and somewhat less with bilateral cases 75%. Our results correlate well with D. Packer and M. Solar's¹¹ results.

Regarding the general and local anaesthesia used for operative procedure, many authors of the west prefer general anaesthesia. Advantages of local anaesthesia are mentioned under surgical techniques. In our study 7 (14%) cases were operated under general anaesthesia and 43 patients (86%) under local anaesthesia. The type of anaesthesia had no bearing on the outcome of surgery. After closure of perforation in the tympanic membrane, loud sounds don't reach the round window directly and thus protects the cochlea from the direct impact of loud noises. Protection at oval window is by stapedial reflex.

Complications: In our study of 50 cases there were no complications except one case. The only complication occurred in one patient postoperatively was granulation formation which was treated by antibiotic- steroid medication, the final result was that the graft has taken up well with good hearing improvement. In our study there were no cases of epithelial pearls, medialisation or lateralization of graft. No care of iatrogenic cholesteatoma occurred in our study.

Conclusion

It is an easier operation to perform and gave better access to the middle ear and ossicles. Graft take rate or success rate is slightly higher. The hearing results are better and complications are less. The overall analysis showed that the graft take rate was not influenced significantly by the size/site of perforation, age, sex, condition of the middle ear, etiology, side of disease, state of hydration of graft, GA or LA. An associated symptom like tinnitus, giddiness is relieved and also round window is protected from the direct impact of loud noises by this simple procedure. Myringoplasty using the underlay technique with temporalis fascia as graft in an easy technique which gives a high success rate as far as closure of perforation in tympanic membrane and improvement in hearing is concerned with minimal rate of complications.

Conflict of interest: None

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