

# Fat Graft Myringoplasty versus Chemical Cauterization in Small Tympanic Membrane Perforation: A Comparative Study

<https://doi.org/10.47210/bjohns.2024.v32i1.62>

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## ABSTRACT

### Introduction

Tympanic membrane perforation is mostly due to infection, trauma or post tympanostomy tube insertion. A variety of autografts have been used for closure of tympanic membrane perforation such as perichondrium, temporalis fascia, cartilage fat, platelet rich plasma, and chemical cauterization.

### Materials and Methods

A Prospective, Comparative and Randomized study was done. Eighty five Patients visiting E.N.T Outpatient department at tertiary care center were selected fulfilling the inclusion criteria and exclusion criteria.

### Results

Out of 43 patients in fat graft myringoplasty, the surgery was successful in 39 (90.70%) patients. However, the success rate in chemical cauterization was found to be 88% (in 37 out of 42 patients). Overall success rate is 89.40% (in 76 out of 85).

### Conclusion

Fat graft myringoplasty and chemical cauterization are strongly recommended for closure of small tympanic membrane perforations; however multiple sittings are required for chemical cauterization.

### Keywords

Fat Graft; Chemical Cauterization; Myringoplasty

Tympanic membrane perforation is mostly due to infection, trauma or post tympanostomy tube insertion.<sup>1</sup> Long standing tympanic membrane perforation may cause hearing loss, middle ear infection and cholesteatoma formation even if the size of tympanic membrane perforation is small. Also persons with tympanic membrane perforations cannot participate in water sports or may be unfit for skilled jobs such as air pilot, scuba diving, military services etc. Therefore, repair of tympanic membrane perforation is required regardless of size of perforation.<sup>2</sup> A variety of autografts have been used for closure of tympanic membrane perforation such as perichondrium,<sup>3,4</sup> temporalis fascia,<sup>5</sup> cartilage,<sup>5,6</sup> fat,<sup>7</sup> platelet rich plasma,<sup>4</sup> and chemical cauterization.<sup>8,9</sup>

Temporalis fascia is the most common material used for closure of medium and large tympanic membrane perforation. Use of fat as graft material was first introduced by Ringenberg in 1962. Fat is an active

material, it has angiogenic and survival factors like monobutylin, prostaglandins, interleukins, cytokines and tumor necrosis factors which restores, repairs the fibrous layer and promotes revascularization which is essential for success of free flap.<sup>11</sup> Chemical cauterization using silver nitrate helps in breaking up fibrous band, promotion of granulation tissue and new tissue formation at the margin of perforations.<sup>13</sup> In this study, we evaluated the

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success rate of closure of small tympanic membrane perforation in fat graft myringoplasty and chemical cauterization by otoscopic examination and hearing improvement in fat graft myringoplasty and chemical cauterization by audiological assessment as well as comparison between two.

### Materials and Methods

A Prospective, Comparative and Randomized study study was carried out in the Department of Otorhinolaryngology at tertiary care centre, during a period of 22 months. Eighty five Patients visiting E.N.T Outpatient department were selected fulfilling the inclusion criteria (aged 15 to 50 years with small tympanic membrane perforation involving one quadrant or 25% area of pars tensa or upto 4mm diameter, dry perforation for at least 6 weeks, perforation for at least 3 months, small residual perforation, healthy middle ear mucosa, conductive hearing loss not exceeding 30db) and exclusion criteria (active ear discharge, mixed hearing loss, or sensorineural hearing loss, associated middle ear cavity pathology (cholesteatoma, ossicular pathology, retraction pocket), tympanic membrane with tympanosclerosis, atrophic area or pars flaccida retraction, marginal perforation, sinusitis / history of allergy, pregnancy). Patients were randomly divided into two groups (minimum of 40 patients in each)

Group A: fat graft myringoplasty [Fig.1-4]

Group B: chemical cauterization [Fig. 5-7]



**Fig. 1. Showing fat graft harvesting from ear lobule**



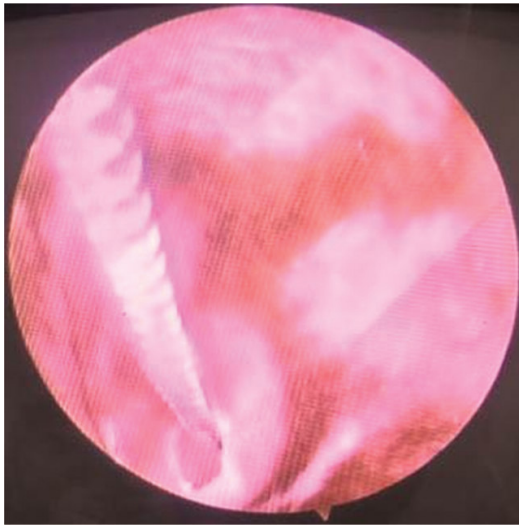
**Fig. 2. Showing freshening of tympanic membrane perforation**



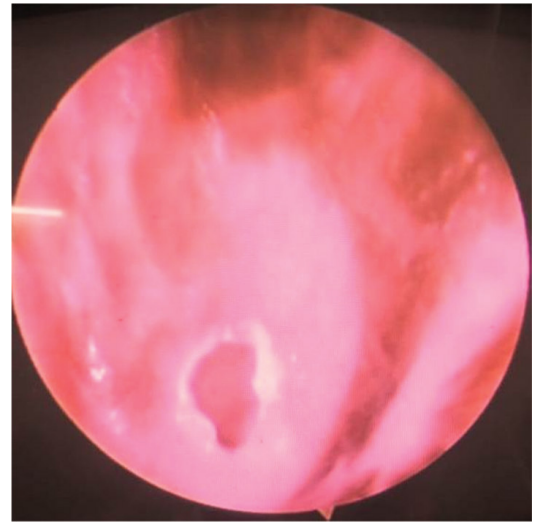
**Fig. 3. Showing plugged fat graft in tympanic membrane perforation**



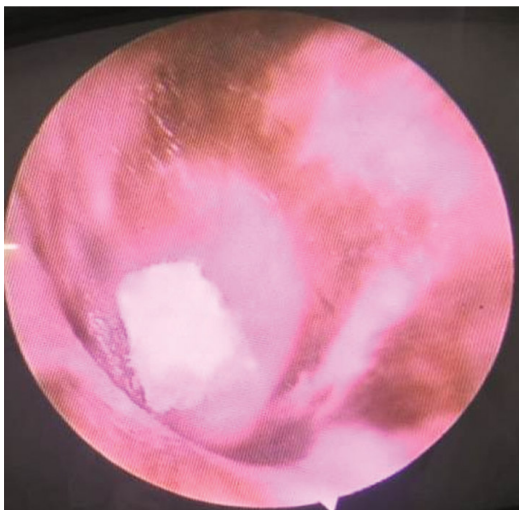
**Fig. 4. Showing gel foam around fat graft**



**Fig. 5.** Showing application of 50% trichloroacetic acid using probe



**Fig. 6.** Showing blanched tympanic membrane margins



**Fig. 7.** Showing gel foam kept over tympanic membrane perforation

Pre operative investigations - Pure Tone Audiometry, Examination under Microscope / X-ray mastoid (whenever required), Routine investigations for taking patient under local anaesthesia were done.

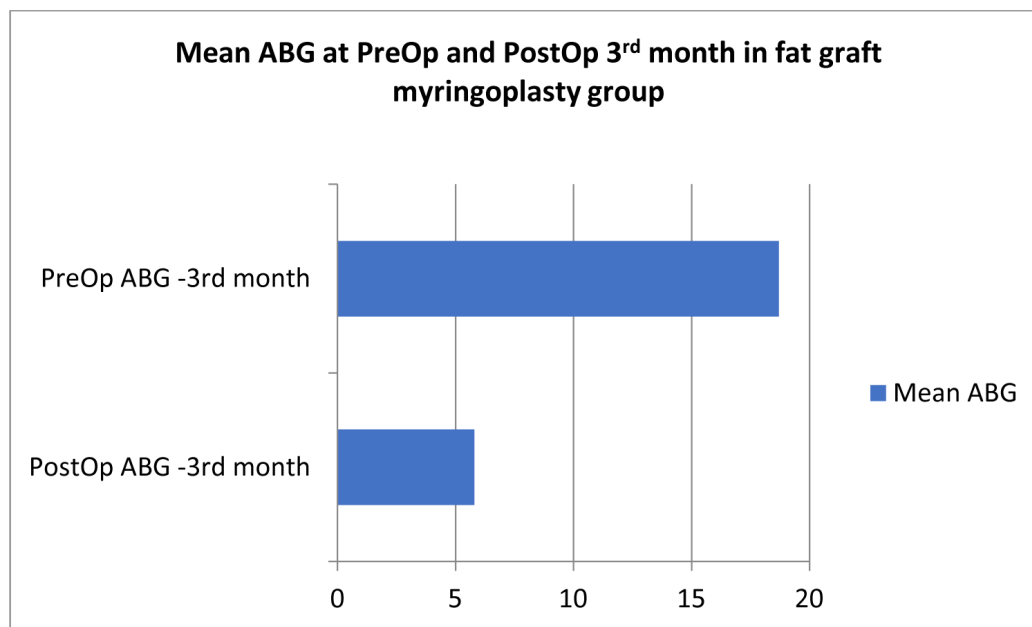
After obtaining written and informed consent from the patients, detailed medical history taken & clinical examination done. Site (quadrant) of perforation recorded. Size of perforation was considered small if tympanic

membrane perforation involves one quadrant or 25% area of pars tensa. Relevant hematological, radiological and audiological assessment done. All patients were followed up weekly for 1<sup>st</sup> month, biweekly for 2<sup>nd</sup> and 3<sup>rd</sup> month.

### Results

Out of 43 patients in fat graft myringoplasty group, 2 patients had Pre-op ABG  $\leq 10$ dB, 25 had ABG of 11-20dB, 16 had ABG of 21-30dB, whereas among 42 patients of chemical cauterization group, 2 had Pre-op ABG  $\leq 10$ dB, 24 had ABG of 11-20dB, and 16 patients had Pre-op ABG of 21-30dB whereas among 42 patients of chemical cauterization group, 2 had Pre-op ABG  $\leq 10$ dB, 24 had ABG of 11-20 dB, and 16 patients had Pre-op ABG of 21-30 dB [Table: I, II]. In the present study, patients who underwent fat graft myringoplasty had Pre-op mean ABG of 18.7dB and Post-op 3rd month mean ABG of 5.8dB patients who underwent chemical cauterization had Pre-op mean ABG of 18.5dB and Post-op 3rd month mean ABG of 5.8Db [Table: I, II]. Out of 43 patients in fat graft myringoplasty, the surgery was successful in 39 (90.70%) patients [Table: III, IV]. However, the success rate in chemical cauterization was found to be 88% (in 37 out of 42 patients). Overall success rate is 89.40% (in 76 out of 85) [Table: III, IV].

**Table I: Showing mean ABG at Pre-op and Post-op 3<sup>rd</sup> month in fat graft myringoplasty group**



**Table II: Showing comparison of Pre-op and Post-op 3<sup>rd</sup> month mean ABG in chemical cauterization group**

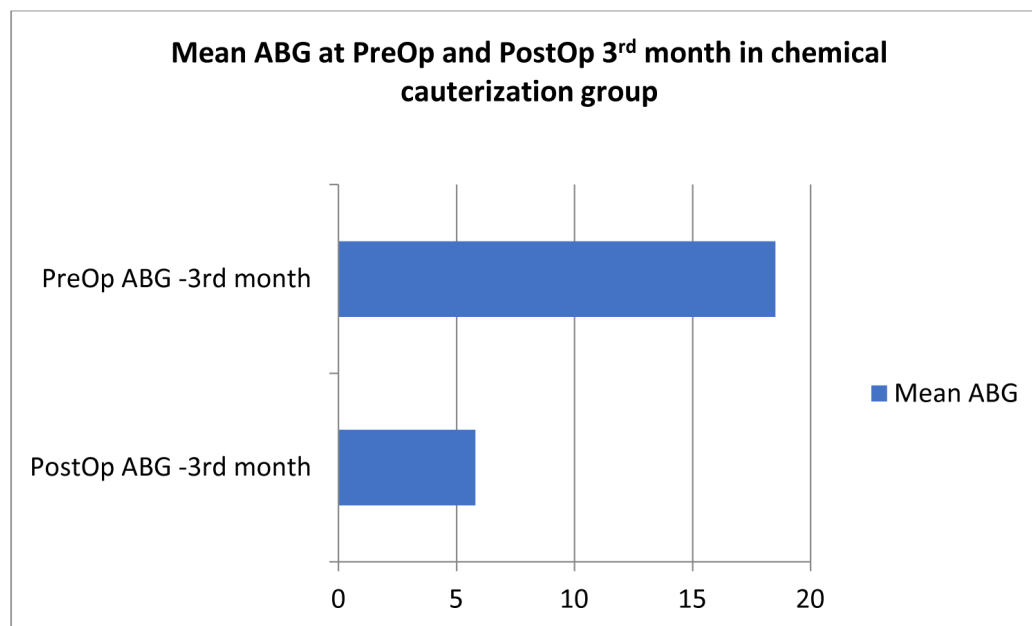


Table III: Showing Post-op anatomical success rate of the two groups

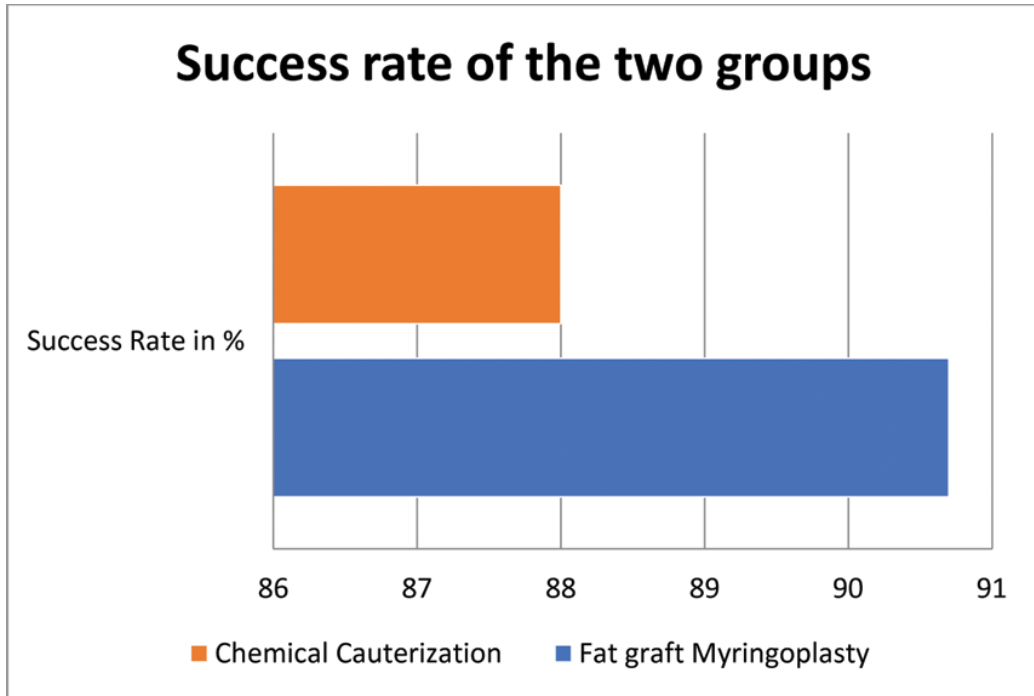
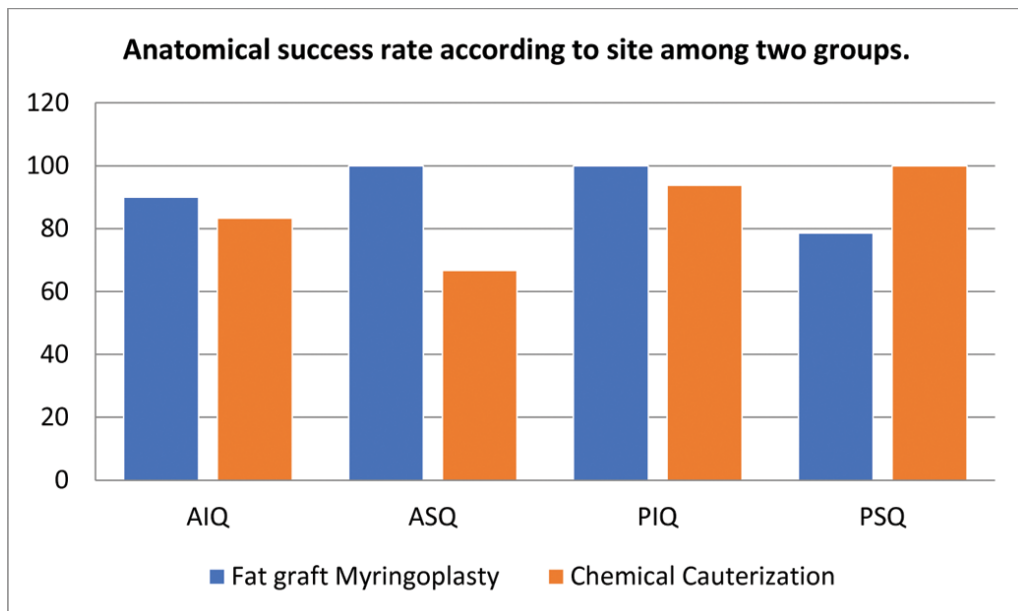


Table IV: Showing anatomical success rate according to site among two groups.



## Discussion

In the present study 27.1% had tympanic membrane perforation involving AIQ, 12.9% in ASQ, 34.1% in PIQ, and 25.8% in PSQ. No statistical significance could be established between the two study groups in relation to the site of perforation. Debnath et al<sup>4</sup> and Kim et al<sup>5</sup> found no difference in success rate when comparing anterior perforations with posterior perforations whereas Acar et al<sup>6</sup> found that posterior perforation had significantly lower healing rate in their study.

Out of 43 patients in fat graft myringoplasty group, 2 patients had Pre-op ABG  $\leq 10$ dB, 25 had ABG of 11-20dB, 16 had ABG of 21-30dB, whereas among 42 patients of chemical cauterization group, 2 had Pre-op ABG  $\leq 10$ dB, 24 had ABG of 11-20dB, and 16 patients had Pre-op ABG of 21-30dB. Thus, no statistically significant difference was observed in the two groups with regard to Pre-op ABG.

In the present study, patients who underwent fat graft myringoplasty had Pre-op mean ABG of 18.7dB and Post-op 3<sup>rd</sup> month mean ABG of 5.8dB. There was statistically significant improvement in mean ABG postoperatively in the fat graft myringoplasty group (p value 0.001). and patients who underwent chemical cauterization had Pre-op mean ABG of 18.5dB and Post-op 3<sup>rd</sup> month mean ABG of 5.8dB. There was statistically significant improvement in mean ABG Postoperatively in the chemical cauterization group (p value 0.001). Overall postoperative mean ABG gain of fat graft myringoplasty group was  $5.8 \pm 6.2$ dB and chemical cauterization group was  $5.8 \pm 5.5$ dB. Thus, both procedures have similar outcomes.

Whereas, In the study done by Debnath et al (2013), the mean pre-op, the mean post-op and the mean gain was  $33.83 \pm 4.41$ ,  $17.83 \pm 2.84$  and  $16 \pm 4.02$  respectively for the fat graft myringoplasty group whereas the mean pre-op, the mean post-op and the mean gain was  $24.66 \pm 2.03$ ,  $16 \pm 2.03$  and  $8.66 \pm 3.69$  respectively for the group that underwent chemical cauterization. The result shows that Fat plug myringoplasty had better post-op gain.<sup>15</sup>

Mandour et al (2018) in his study reported Pre-op mean ABG 20.76db (18.95-22.57), Post-op mean ABG 6.64dB

(5.69-7.58) and mean gain 14.12dB (12.99-14.99) at 3 months for closed perforation for PRP fat myringoplasty.<sup>6</sup>

Han et al (2021) reported Pre-op mean ABG  $15.9 \pm 8.7$  db, Post-op mean ABG  $11.0 \pm 8.4$  dB and the mean gain  $4.9 \pm 4.2$  dB for fat myringoplasty.<sup>3</sup>

Diaz et al (2020) reported mean Pre-op ABG, mean Post-op ABG and mean hearing gain of 30.2, 10.2 and 20dB respectively in fat myringoplasty group.<sup>4</sup>

Out of 43 patients in fat graft myringoplasty, the surgery was successful in 39 (90.70%) patients. However, the success rate in chemical cauterization was found to be 88% (in 37 out of 42 patients). Overall success rate is 89.40% (in 76 out of 85). Anatomical outcome i.e., successful closure of tympanic membrane perforation was compared between the two groups. Though the success rate was higher with fat graft myringoplasty versus chemical cauterization, but statistical significance could not be established in either group. Debnath et al in their study found 90.9% and 83.33% success rate with fat plug myringoplasty and chemical cauterization respectively which is also seen in this study.<sup>15</sup>

Ko et al (2022) reported 96.8% success rate with fat plug myringoplasty.<sup>16</sup> Kim et al (2021) reported 90% success rate for fat myringoplasty which was similar to our study.<sup>1</sup>

In a study by Ajaiy et al reported 83.3% success rate,<sup>10</sup> Han et al reported 89.6% success rate<sup>3</sup> and Mandour et al reported 88% success rate<sup>6</sup> for fat myringoplasty respectively.

## Conclusion

Fat graft myringoplasty and chemical cauterization are equally effective in closing small tympanic membrane perforations. They are simple to perform, less time consuming, cost effective with minimal patient morbidity and significant hearing improvement. Hence, we conclude both fat graft myringoplasty and chemical cauterization are strongly recommended for closure of small tympanic membrane perforations; however multiple sittings are required for chemical cauterization.

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