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Comparison of Endosopic Cartilage Tympanoplasty in Dry and Moist Ears in Mucosal Type of Chronic Suppurative Otitis Media

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ORIGINAL ARTICLE

Comparison of Endosopic Cartilage Tympanoplasty in Dry and Moist Ears in Mucosal Type of Chronic Suppurative Otitis Media

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Abstract

Background: ***Chronic suppurative otitis media is distinguished by the presence of inflammation that persists for a duration longer than three months on the mucoperiosteal lining of the middle ear cleft.***

Aims and objectives: ***To compare tympanoplasty success in dry & moist ears in mucosal types of chronic suppurative otitis media.***

Patients and methods: ***This was a prospective study performed on 52 participants. There were 34 ladies (65.3 percent) and 18 males (34.7 percent) between the ages of 19 and 60, with a mean age of 41.73 ± 12.79 for the first group and a mean age of 43.23 ± 13.6 for the second group at Al-Azhar University outpatient clinics from June 2022 to October 2023. Patients were classified into two categories. Patients were divided into two groups.***

Results: ***There was a high statistically significant variance among the AB gaping pre- & post-operation in both categories (P<0.001). No statistically significant variation was observed among the two groups (dry and moist) as regards AB gaping pre-operatively (P = 0.563), AB gap improvement (hearing improvement) post-operatively (P = 0.620), and graft success (P = 0.385).***

Conclusion: ***CSOM and moist ears are not contraindications for tympanoplasty operations. This could shorten the time and reduce the cost of medical treatment before surgery. Both groups, either dry or moist, have an equal post-operative success rate.***

Keywords: Endosopic cartilage tympanoplasty; chronic suppurative otitis media

1. Introduction

CSOM is characterized by an inflamed mucoperiosteal membrane in the middle ear cleft that does not go away for a period exceeding three months, discharge from the ear through the tympanic membrane, and impaired hearing. This can significantly impact an individual's daily functioning. Ear discharge can persist for months or years in patients with chronic otitis media, accompanied by progressive hearing loss and potentially fatal infectious complications. [1]

Tympanoplasty is the primary operative intervention conducted to correct hearing damage and prevent recurrent otorrhea by repairing tympanic membrane perforation. Tragal cartilage is an effective grafting material used for tympanoplasty as it provides stability against retraction. [2]

Being the most frequently performed surgical procedure to treat CSOM, tympanoplasty on patients with discharging ears made otologists go through an ongoing dilemma. This is due to the misconception that surgery on moist ears has a comparatively lower success rate. [3]

It is generally accepted that ears that have been dry for a minimum of three months are the most appropriate candidates for tympanoplasty. A widespread opinion alleges that active ear discharge constitutes a contraindication for tympanoplasty as it induces graft rejection. [4]

Concerning the performance of tympanoplasty on moist ears, controversies persist. According to the literature, certain surgeons adopt the view that dry tympanoplasty yields superior outcomes compared to moist tympanoplasty, whereas others maintain the contrary view. [5]

The objective of the study was to compare the success rates of graft uptake, auditory improvement, and time to dry ear following surgery among moist and dry ears undergoing tympanoplasty for chronic suppurative otitis media.

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2. Patients and methods

This was a prospective study performed on 52 participants. They were 34 ladies (65.3 percent) and 18 men (34.7 percent). They were between the ages of 19 and 60, with a mean age of 41.73 ± 12.79 for the first group and a mean age of 43.23 ± 13.6 for the second group. Persistent suppurative otitis media with central drum perforations. They attended Al-Azhar University outpatient clinics from June 2022 to October 2023. Patients were classified into two categories: Group A: 26 participants (patients who had undergone endoscopic cartilage tympanoplasty for dry central perforation) and Group B: 26 patients (patients who had undergone endoscopic cartilage tympanoplasty for moist central perforation). Written consent was obtained from each patient. The ethical committee of the faculty of medicine at Alazhar University approved this study.

Inclusion criteria

The patient's age range is 18–60 years; the site of perforation is central perforation; there is conductive hearing loss (CHL); and the air gap is less than 35 dBs.

Exclusion criteria

Patients with total or subtotal perforation, patients with cholesteatoma, and patients who were not fit for surgery.

Methods

Each patient included in the study was subjected to the following:

Full history-taking

Personal history, family history, and history of the present illness, as well as the amount, color, and odor of discharge if present.

Clinical examination

General: Vital signs and local: The first group underwent otoscope and ear endoscope examinations of the ear and nose, and medical treatment in the form of antibiotics and ear drops until the ear became dry.

Investigations

Laboratory tests include complete blood count (CBC) and the international normalized ratio (INR), audiological tests such as pure tone audiometry and tympanometry, and radiological tests such as CT scan to assess the condition of the mastoid and middle ear, exclude other causes of discharge, and confirm the diagnosis as CSOM of mucosal type.

Surgical repair (one-day surgery)

Pre-operative preparation and informed consent.

Surgical techniques

In order to perform the hypotensive technique, patients were positioned in a supine position and under general anesthesia. Every operation was executed in accordance with established principles of aural surgery. In all instances, prior to harvesting the graft, endoscopes measuring 2.7 mm and 4 mm in diameter and 0° and 17 cm in length were utilized to clear the ear canal and evaluate tympanic membrane perforation endoscopically. Then, a tragal cartilage graft is harvested. An injection of local anesthetic, consisting of epinephrine at a concentration of 1/100,000, was administered into the outer ear canal's four quadrants. As required, perforation margins were de-epithelized. By elevating the annulus and tympan meatal membrane, access was gained to the middle ear. Approaching the malleus laterally and the membrane remnant medially, the graft that had been taken was positioned in the appropriate place. Finally, gel foam was inserted into the graft.

Figure 1. Tympanoplasty in dry ear

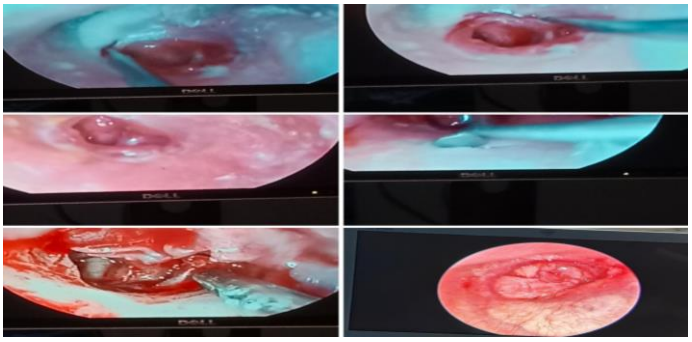


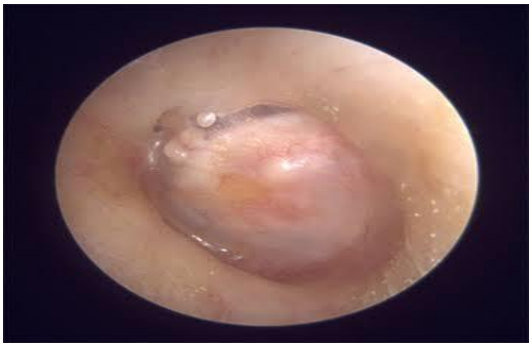
Figure 2. Tympanoplasty in moist ears

A comparison among the two categories was made according to:

Success rate of graft uptake, auditory outcomes after three months, and time to dry the ear post-surgery

Post-operative follow-up

Endoscopic examination after 1 week, 2 weeks, 1 month, and 3 months, and pure tone audiometry & tympanometry after 3 months.



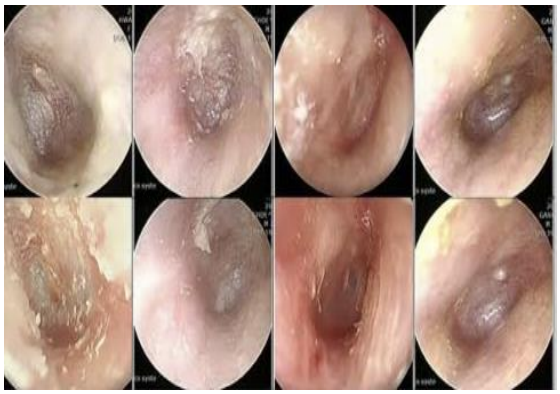


Figure 3. Endoscopic view of TM 3months after surgery

Sample size:

We used Cochran's Formula to calculate sample size.[6]

$$\text{Sample Size} = \frac{Z_{1-\alpha/2}{}^2 P(1-P)}{d^2}$$

Z1-α/2= is standard normal variant (at 10% type I error it is 1.645).

P= Expected proportion in populationbased on previous studies.

d= absolute error (0.05)

$$\text{Sample Size} = \frac{1.645^2 * 0.05(1-0.05)}{0.05^2} = 52$$

Sample Size = 52

Z1-α/2 = 1.645 d = (0.05).

Statistical analysis

Utilizing version 20.0 of the IBM SPSS software program, the information was entered into the computer and investigated. (Armonk, NY: IBM Corp.) By employing percentages and numbers, qualitative data were described. A test known as the Kolmogorov-Smirnov was utilized in order to determine whether or not the distribution was normal. As well as the median, the means, the standard deviations, the interquartile range (IQR), and the range (lowest and maximum values) were employed to characterize the quantitative data. At the 5% significance level, the derived results were deemed significant. The tests utilized were: To compare distinct groups using categorical variables, the chi-square test is applied. When comparing two groups of subjects using normally distributed variables of a quantitative nature, the student t-test is utilized. In the case of nonparametric quantifiable variables, using the Mann-Whitney test, two categories under investigation are compared, while the Wilcoxon test is applied to compare two repeated measures.

3. Results

This table demonstrated that the disparity was not statistically significant in the demographic data among the groups under study (p value >0.05). (Table 1)

Table 1. Comparison among examined cases consistent with demographic data.

	GROUP A (N=26)		GROUP B (N=26)		TEST OF SIG.	P
AGE RANGE.	19 – 59		20 – 60		t= 0.410	0.684
MEAN ± SD.	41.73 ± 12.79		43.23 ± 13.6			
SEX	No.	%	No.	%		
FEMALE	18	69.2	16	61.5	χ^2= 0.340	0.560
MALE	8	30.8	10	38.5		

SD: Standard deviation χ2: Chi square test t: student t-test p: p value for comparing between studied groups*: Statistically significant at p ≤ 0.05

Table 2 compares the 2 studied groups according to graft uptake success post-operatively and shows that no statistically significant variation was observed among the groups under study as regard graft success (Pvalue = 0.385, statistically significant at p ≤ 0.05). (Table 2)

Table 2. Comparison among examined cases in accordance with graft success.

	GROUP A (N=26)		GROUP B (N=26)		TEST OF SIG.	P
GRAFT SUCCESS	No.	%	No.	%		
FAILURE	2	7.7	4	15.4	χ^2= 0.754	0.385
SUCCESS	24	92.3	22	84.6		

χ2: Chi square test p: p value for comparing between studied groups *: Statistically significant at p ≤ 0.05

This table showed that a significant statistical change was observed among the groups. under study as regard time to dry ear after perforation (P<0.001). (Table 3)

Table 3. Comparison among examined cases in accordance with time (by weeks) to dry ear after operation.

	GROUP A (N=26)	GROUP B (N=26)	TEST OF SIG.	P
TIME TO DRY EAR				
RANGE.	2 – 4	3 – 6	t= 6.615	<0.001*
MEAN ± SD.	2.96 ± 0.77	4.69 ± 1.09		

t: student t-test p: p value for comparing between studied groups *: Statistically significant at p ≤ 0.05.

Table 4 compares the AB gap (in dB) before and after tympanoplasty in every group and the hearing improvement in the 2 groups after the operation. There was a high statistically significant variance among the AB gaping pre- and post-operation in both categories (P<0.001). This table

also showed that no statistically significant variation was observed among the two groups (dry and moist) as regard AB gaping pre-operatively (P = 0.563) and AB gap improvement (hearing improvement) post-operatively (P = 0.620). (Table 4)

Table 4. Comparison among examined cases in accordance with AB gaping.

	GROUP A (N=26)	GROUP B (N=26)	TEST OF SIG.	P
PREOPERATIVE				
RANGE.	4 – 31	11 – 27	U=	0.563
MEDIAN (IQR)	19 (11.25 – 22)	18.5 (16 – 23.5)	306.5	
POSTOPERATIVE				
RANGE.	0 – 24	0 – 26	U=	0.620
MEDIAN (IQR)	10 (3 – 17)	12.5 (2.75 – 18)	311.0	
P(Z)	<0.001*	<0.001*		

IQR: Interquartile range U: Mann-Whitney test Z: Wilcoxon test

P: p value for comparing between studied groups *: Statistically significant at p ≤ 0.05

4. Discussion

Recurrent otorrhea caused by a tympanic membrane perforation is what distinguishes CSOM. Chronic suppurative otitis media frequently results in conductive hearing impairment. Tympanoplasty, the established and standard procedure, is utilized to close perforations in the tympanic membrane and reconstruct the middle ear ossicles. Ordinarily, it is assumed that ears that have been dry for a minimum of three months are the most suitable for surgery. [6,7]

The current study revealed no statistically significant variation in the graft success rate among the two categories under investigation (P value = 0.385). Both groups, dry or wet, have an equal postoperative success rate. This result could change the previous idea about tympanoplasty operations and the need for the ear to be dry before the operation to reduce the rate of graft rejection.

At a six-month follow-up, Lou and Li showed that the graft uptake success for cases involving moist ears was 86.2 percent (25 out of 29) and 85.9% (67 out of 78) in cases regarding dry ears, respectively. Without statistical significance (p = 0.583), no distinction existed among the two categories. [8]

In their study, Chandrasekhar et al. found that graft absorption rates were 90% in the dry ear and 86.7% in the moist ear. The p-value was 0.688, proving that no statistical difference really existed. [9]

In their study, Gamra et al. found that the graft integration rate varied not significantly (p = 0.9) between the two groups, with 88 percent in the wet ear category and 87.5 percent in the dry ear category. [10]

The present study found that there was no statistically significant variation among the categories under investigation with respect to AB gaping (P=0.563). A significant statistical variance (P<0.001) was observed in both groups with regard to the AB gap change before and after the operation.

Maiti and Sinha discovered that among the 56 patients in the moist ear group, 50 (89.28%) experienced an improvement in hearing. 44 of 49 patients in the dry ear group experienced an improvement in hearing (89.79%). The observed outcome lacks statistical significance (p-value = 0.9999). [11]

According to the findings of Yang et al., the average preoperative ABG for the dry ear group was 17.34 ± 8.71 dB, and the average postoperative ABG was 10.97 ± 7.91 dB. The ABG closure was 6.38 ± 4.71 dB. The ABG closure in the wet-ear group was 8.12 ± 6.11 dB, and the preoperative ABGs were 19.09 ± 5.85 dB and 11.38 ± 4.68 dB, respectively. ABGs showed a considerable drop between preoperative and postoperative readings in both the wet-ear and dry-ear groups. Nevertheless, the hearing gains of the two cohorts did not differ significantly. (P = 0.39). [12]

Lou and Li discovered that the moist ear group experienced an average improvement in hearing of 12.95 ± 9.73 dB postoperatively, while the dry ear group recorded a mean improvement of 13.41 ± 8.34 dB. However, the variation among the two categories was not statistically significant (p = 0.472). This variation was statistically significant (p < 0.001): the average air-bone separation in the dry ear group decreased from 30.84 ± 6.81 dB pre-operatively to 17.22 ± 9.10 dB postoperatively. The moist ear group exhibited a mean preoperative air-bone gap of 29.81 ± 9.61 dB and an average postoperative air-bone gap of 18.14 ± 9.75 dB; statistical analysis provided additional support for this variation (p < 0.001). [8]

With respect to the duration, until the ear became dry, our research revealed a statistically significant disparity among the groups under investigation (P<0.001).

Yang et al. found that the time to achieve a dry ear was 2.93 ± 0.70 weeks postoperatively in the dry-ear group and 4.56 ± 3.96 weeks postoperatively in the wet-ear group. It took significantly longer to achieve a dry ear in the wet-ear group than in the dry-ear group (P =.0005). [12]

4. Conclusion

CSOM and moist ears are not contraindications for a tympanoplasty operation.

This could shorten the time and reduce the cost of medical treatment before surgery. Both groups, either dry or moist, have an equal postoperative success rate.

Disclosure

The authors have no financial interest to declare in relation to the content of this article.

Authorship

All authors have a substantial contribution to the article

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Conflicts of interest

There are no conflicts of interest.

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