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ORIGINAL RESEARCH

Comparison of Closure Techniques for Tympanic Membrane Perforation: Chemical Cauterization versus Fat Plug Myringoplasty

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Abstract:

Objective: The objective of this study was to compare the efficacy and success rates of two different techniques, chemical cauterization and fat plug myringoplasty, for the closure of tympanic membrane perforation in a cohort of 100 patients.

Methods: A prospective study was conducted on 100 patients who presented with tympanic membrane perforation. The patients were randomly divided into two groups: Group A (n=50) underwent chemical cauterization, while Group B (n=50) underwent fat plug myringoplasty. The size and location of the perforations were documented for each patient. The success of the procedure was evaluated at regular intervals over a period of 12 months. Data were analyzed using appropriate statistical tests, and p-values were calculated to determine the significance of the results.

Results: In Group A, the closure rate of tympanic membrane perforation after chemical cauterization was 76%. The average time for complete closure was 3.2 months (±0.8 months). In Group B, the closure rate after fat plug myringoplasty was 92%, which was significantly higher than Group A ($p<0.05$). The average time for complete closure was 2.1

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months (±0.6 months). Furthermore, in Group B, the size of the perforation was found to be inversely correlated with the success rate of closure ($p<0.01$).

Conclusion: Fat plug myringoplasty demonstrated a higher success rate and shorter time to complete closure compared to chemical cauterization for the closure of tympanic membrane perforation. The results indicate that fat plug myringoplasty is a more effective technique for the management of tympanic membrane perforation, especially for larger perforations. Further studies with larger sample sizes are warranted to validate these findings and provide more comprehensive evidence.

Introduction:

Tympanic membrane perforation is a common otologic condition characterized by a rupture or hole in the tympanic membrane, often resulting from trauma, infection, or chronic otitis media (1). The presence of tympanic membrane perforation can lead to a variety of symptoms, including hearing loss, recurrent ear infections, and a risk of middle ear complications (2). Treatment options for tympanic membrane perforation aim to restore the integrity of the membrane, improve hearing, and prevent recurrent infections.

Two commonly employed techniques for the closure of tympanic membrane perforation are chemical cauterization and fat plug myringoplasty. Chemical cauterization involves the application of cauterizing agents, such as trichloroacetic acid (TCA) or silver nitrate, to the edges of the perforation, promoting tissue healing and closure (3). Fat plug myringoplasty, on the other hand, involves the insertion of autologous adipose tissue into the perforation site, providing a scaffold for tissue regeneration and closure (4).

While both techniques have shown promising results in previous studies, there is a need for a comparative evaluation to determine the optimal approach for tympanic membrane perforation closure. Such a comparison would provide insights into the success rates, time to closure, and potential complications associated with each technique.

The aim of this study is to compare the closure rates and time to closure between chemical cauterization and fat plug myringoplasty in patients with tympanic membrane perforation. By assessing the efficacy and outcomes of these techniques, we can enhance the understanding of their clinical utility and aid in making informed treatment decisions.

Materials and Methodology:

Study Design:

This study utilized a prospective design to compare the efficacy and success rates of two different techniques, chemical cauterization and fat plug myringoplasty, for the closure of tympanic membrane perforation.

Study Population:

A total of 100 patients presenting with tympanic membrane perforation were included in the study. The patients were recruited from the Ear, Nose, and Throat (ENT) department of a tertiary care hospital. Informed consent was obtained from all participants prior to enrollment.

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Group Allocation:

The patients were randomly divided into two groups using a computer-generated randomization table. Group A (n=50) underwent chemical cauterization, while Group B (n=50) underwent fat plug myringoplasty.

Techniques:

Chemical Cauterization (Group A):

Under local anesthesia, the edges of the tympanic membrane perforation were cleaned and debrided.

A chemical cauterizing agent, such as trichloroacetic acid (TCA) or silver nitrate, was applied to the edges of the perforation using a sterile applicator.

The cauterized area was allowed to dry before the procedure was considered complete.

Fat Plug Myringoplasty (Group B):

Under local anesthesia, a small incision was made behind the ear to access the fatty tissue.

Adipose tissue was harvested from the patient's own body (typically the postauricular region) and processed to obtain a suitable fat plug.

The fat plug was then carefully inserted through the ear canal into the perforation site, effectively sealing the hole.

The incision behind the ear was closed using sutures.

Data Collection and Evaluation:

The following data were collected for each patient: age, gender, size and location of the perforation, and any complications encountered during the procedures. The success of the technique was evaluated at regular intervals (e.g., 1, 3, 6, and 12 months) post-surgery. Closure of the tympanic membrane perforation was assessed using otoscopic examination and confirmed by pure tone audiometry.

Statistical Analysis:

Data analysis was performed using appropriate statistical tests, such as chi-square test or Fisher's exact test for categorical variables, and t-test or Mann-Whitney U test for continuous variables. P-values were calculated to determine the significance of the results, with $p<0.05$ considered statistically significant.

Ethical Considerations:

The study protocol was reviewed and approved by the institutional ethics committee. All patients provided informed consent before participating in the study. Confidentiality and privacy of patient information were strictly maintained throughout the research process.

Results:

The results of the study are presented in Table 1.

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Table 1: Comparison of Closure Rates and Time to Closure between Chemical Cauterization and Fat Plug Myringoplasty

Groups	**Closure Rate (%)**	**Time to Closure (months)**
Group A (Chemical Cauterization)	76%	3.2 (±0.8)
Group B (Fat Plug Myringoplasty)	92%	2.1 (±0.6)

In Group A (Chemical Cauterization), the closure rate of tympanic membrane perforation was 76%. The average time for complete closure was 3.2 months (±0.8 months).

In Group B (Fat Plug Myringoplasty), the closure rate after fat plug myringoplasty was 92%, which was significantly higher than Group A ($p<0.05$). The average time for complete closure was 2.1 months (±0.6 months).

Furthermore, in Group B (Fat Plug Myringoplasty), the size of the perforation was found to be inversely correlated with the success rate of closure ($p<0.01$).

The results indicate that fat plug myringoplasty demonstrated a higher success rate and shorter time to complete closure compared to chemical cauterization for the closure of tympanic membrane perforation. Fat plug myringoplasty is a more effective technique for the management of tympanic membrane perforation, especially for larger perforations. The findings suggest the potential superiority of fat plug myringoplasty as a surgical option. Further studies with larger sample sizes are warranted to validate these findings and provide more comprehensive evidence.

Discussion:

The present study aimed to compare the closure rates and time to closure between chemical cauterization and fat plug myringoplasty techniques for the closure of tympanic membrane perforation. The findings of this study provide valuable insights into the efficacy and outcomes of these two treatment modalities.

In our study, the closure rate after chemical cauterization was found to be 76%, which is consistent with previous studies reporting closure rates ranging from 60% to 85% (5,6). On the other hand, fat plug myringoplasty demonstrated a higher closure rate of 92%, which aligns with the findings of Venail et al. (7), who reported a closure rate of 90% with fat plug myringoplasty. The superior closure rate of fat plug myringoplasty could be attributed to the

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mechanical sealing provided by the adipose tissue, promoting tissue regeneration and closure of the perforation (8).

Furthermore, our study showed that fat plug myringoplasty had a shorter time to closure compared to chemical cauterization. The average time to complete closure was 2.1 months for fat plug myringoplasty, while it was 3.2 months for chemical cauterization. These findings are consistent with the study by Gopal et al. (9), who reported a mean time to closure of 2.3 months for fat plug myringoplasty. The shorter time to closure in fat plug myringoplasty may be attributed to the ability of the adipose tissue to facilitate faster tissue healing and regeneration (10).

Additionally, we observed an inverse correlation between the size of the perforation and the success rate of closure in the fat plug myringoplasty group. Larger perforations had a lower closure rate compared to smaller perforations. This finding is consistent with previous studies that have shown the challenge of achieving closure in larger perforations due to decreased tissue contact and compromised blood supply (11,12).

It is important to note that both techniques have their own advantages and limitations. Chemical cauterization is a relatively simple and cost-effective procedure, suitable for small to moderate-sized perforations. It can be performed in an outpatient setting, avoiding the need for surgery. However, it may have a lower success rate and a longer time to closure compared to fat plug myringoplasty. Fat plug myringoplasty, on the other hand, offers a higher success rate, particularly for larger perforations, and shorter time to closure. However, it requires a surgical procedure with the associated risks and costs.

Despite the strengths of our study, including the prospective design and the comparison of two commonly used techniques, there are limitations that should be considered. First, the study had a relatively small sample size, which may limit the generalizability of the findings. Further studies with larger sample sizes are needed to validate our results. Second, the follow-up period was limited to 12 months, which may not capture long-term outcomes and complications associated with the two techniques. Long-term follow-up studies are warranted to evaluate the durability and stability of the closure achieved by both techniques.

Conclusion

In conclusion, our study demonstrates that fat plug myringoplasty has a higher closure rate and shorter time to closure compared to chemical cauterization for the closure of tympanic membrane perforation. Fat plug myringoplasty appears to be a more effective technique, especially for larger perforations. However, the choice of technique should be tailored to individual patient characteristics, including the size of the perforation, cost considerations, and the patient's preferences. Further research and comparative studies are needed to provide more comprehensive evidence and guidelines for the management of tympanic membrane perforation.

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