Efficacy of Tympanoplasty Without Mastoidectomy for Chronic Suppurative Otitis Media

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Objective: To compare the efficacy of tympanoplasty without mastoidectomy in patients with chronic suppurative otitis media (CSOM) vs efficacy in those with dry tympanic membrane (TM) perforations.

Design: Retrospective controlled study based on a prospective database.

Setting: Academic tertiary referral center.

Patients: A total of 150 consecutive patients without cholesteatoma with CSOM or dry perforations alone who underwent tympanoplasty without mastoidectomy from January 2000 through December 2005.

Intervention: Tympanoplasty without mastoidectomy.

Main Outcome Measure: Perforation recurrence. Independent variables were age, surgical approach, perforation size, and revision surgery.

Results: The TM graft failure rate was not significantly worse in the CSOM group compared with the dry perforation group ($P = .48$). The independent variables studied were not statistically related to the success of tympanoplasty except that revision surgery was associated with a slightly reduced success rate ($P = .03$).

Conclusions: The success rate of tympanoplasty without mastoidectomy is at least as good for patients with CSOM as it is for patients with perforation without prior otorrhea. Age ($P = .28$), perforation size ($P = .11$), and surgical approach ($P = .82$) were not significantly related to success rate. Revision surgery was associated with a slightly lower success rate.


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CHRONIC SUPPURATIVE OTITIS MEDIA (CSOM) without cholesteatoma is an entity whose definition and surgical treatment are somewhat controversial. Although its incidence in the Western world is less than 1%, it is more common in developing countries. Chronic suppurative otitis media is considered to be a chronic inflammation of the middle ear and mastoid mucosa in which the tympanic membrane (TM) is not intact and discharge is present. However, the length of time that symptoms must be present to constitute a “chronic” condition is not well defined. Otorrhea may be persistent or intermittent. This entity is also considered distinct in nature from tympanostomy tube otorrhea. Standard treatments for CSOM include debridement, ototopical therapy, and dry ear precautions. In those cases that do not resolve or result in spontaneous healing of the TM with conservative measures, surgical intervention is considered.

The issue of whether mastoidectomy is needed for good surgical outcomes in CSOM remains controversial. Our standard surgical treatment of noncholesteatomatous CSOM is tympanoplasty without mastoidectomy. A mastoidectomy is not performed for the treatment of either CSOM or dry perforations. We designed this study to compare the efficacy of tympanoplasty without mastoidectomy for the treatment of CSOM vs dry perforations.

METHODS

A prospective, computerized database (using Microsoft Access software; Microsoft Corp, Redmond, Washington) of all tympanoplasty and mastoidectomy surgery is maintained by the senior author (C.Y.J.C.) at an academic, tertiary otology practice. The database contained all information necessary for this study, which was designed retrospectively. This study was approved by the local institutional review board.
A total of 205 ears from 192 consecutive patients who underwent tympanoplasty without mastoidectomy for treatment of chronic dry TM perforation (dry perforation group) or CSOM (CSOM group) from January 2000 through December 2005 were obtained from the senior author’s database. The following qualifications were then applied to the database, and the final patients for the study were selected. Excluded patients included those with a history of previous mastoidectomy, diagnosis of current or previous cholesteatoma, pressure equalization tube otorrhea, age younger than 4 years, or a follow-up period of less than 3 weeks. This minimum follow-up time was chosen because this is when the first postoperative visit normally takes place for the principal investigator (C.Y.J.C.), and postoperative audiograms are sometimes obtained starting at this time. Mastoidectomy is not performed by the senior author for CSOM, and therefore no patients were excluded from the analysis because mastoidectomy had been performed.

Patients were assigned to the dry perforation group if there was a TM perforation present and there had been no evidence of otorrhea during the preceding year. Those patients with perforation and any degree of otorrhea, persistent or intermittent, during the preceding year were assigned to the CSOM group.

After application of exclusion criteria, 150 patients remained, resulting in 160 ears available for study. The measured outcome was perforation recurrence. Independent variables studied were age (<12 years vs ≥12 years), incision site (postauricular [PA] vs transcanal [TC]), perforation size (<40% vs ≥40% of the TM), mean follow-up time since surgery, and mean time to perforation. A perforation size of 40% was chosen arbitrarily prior to the start of the study as the threshold between large and small TM perforations. Medial TM grafting was the most commonly used technique. Approximately 90% of all cases in this study were medial grafts. The TM perforation sizes did not differ between the lateral grafting and medial grafting groups. Perforations occurring postoperatively but with spontaneous healing were not considered failures.

Hearing data were available for 151 ears. Mean values were obtained for the preoperative and postoperative air-bone gap (ABG), as well as mean change between these preoperative and postoperative values. Statistical analysis was performed with Excel software (Microsoft Corp). The χ² test was used to determine the statistical significance of all data except for hearing results and mean follow-up time, for which the t test was used. Significance was determined using P < .05 as the cutoff value. Data were analyzed for follow-up of 1 year or less. There were not enough subjects with more than 1 year of follow-up for analysis.

### RESULTS

A total of 88 female ears and 72 male ears were evaluated. The mean age at the time of surgery was younger in the dry perforation group (28.5 years) compared with the CSOM group (33.2 years). The mean duration of follow-up was 36.9 weeks for the CSOM group and 47.0 weeks for the dry perforation group, which was not significantly different (P = .35).

We further analyzed data for follow-up times up to 1 year. The dry perforation group had a slightly higher number of treatment failures at 1 year than the CSOM group. Eight of 113 patients in the CSOM group (7.1%) developed reperforation after initial surgery, whereas 5 of 47 patients in the dry perforation group (10.6%) failed treatment. However, this difference was not statistically significant (P = .48) (Figure 1).

Possible preoperative confounding factors were analyzed. Pediatric age group has been felt by some to be associated with higher failure rates. The percentage of pediatric cases (defined as <12 years old) for the CSOM and dry perforation groups (17.7% vs 17.0%, respectively) was not significantly different (P = .92). In addition, the success rates at 1 year in adult patients vs pediatric patients in general (88.7% vs 92.6%, respectively; P = .28) was not significantly different (Table).

There are some data in the literature that indicate that the PA approach results in a higher success rate than the TC approach. In our study, there was a significantly higher number of patients in the CSOM group who underwent the PA approach (90.3% vs 69.6%; P = .001), which may potentially bias the results. However, the overall suc-

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**Table. Analysis of Potential Confounding Factors**

<table>
<thead>
<tr>
<th>Study Group</th>
<th>Pediatric Age Group, y</th>
<th>Approach</th>
<th>Perforation Size</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>&lt;12 y</td>
<td>≥12 y</td>
<td>PA</td>
</tr>
<tr>
<td>Distribution, %</td>
<td></td>
<td></td>
<td>90.3</td>
</tr>
<tr>
<td>CSOM group</td>
<td>17.7</td>
<td>82.3</td>
<td></td>
</tr>
<tr>
<td>Dry perforation group</td>
<td>17.0</td>
<td>83.0</td>
<td>69.6</td>
</tr>
<tr>
<td>Success rate, %</td>
<td>92.6</td>
<td>88.7</td>
<td>89.6</td>
</tr>
</tbody>
</table>

Abbreviations: CSOM, chronic suppurative otitis media; PA, postauricular; TC, transcanal.

aPotential confounding variables were analyzed. There were significantly more smaller perforations (<40%) and TC approaches in the dry perforation group. However, the success rate at 1 year was equivalent to the 2 groups. Pediatric distribution and success at 1 year were not significant.
cess rate was similar between the 2 approaches in this study (89.6% PA vs 88.0% TC; \( P = .82 \)) (Table).

Similarly, smaller perforations are sometimes thought to have higher success rates of closure than larger perforations. There was a significantly higher percentage of cases of perforation smaller than 40% in the dry perforation group than in the CSOM group (66.0% vs 48.7%; \( P = .046 \)). However, the success rates for perforations smaller than 40% and 40% or larger at 1 year were not significantly different in general (93.0% vs 85.1%, respectively; \( P = .11 \)) (Table).

As expected, revision surgery was a negative predictor of success (81.6% success rate in revision surgery vs 92.8% in primary surgery; \( P = .03 \)) (Figure 2). The distribution of revision cases between the 2 groups, however, was not significantly different (26.5% in the CSOM group vs 40.4% in the dry perforation group; \( P = .08 \)) (Figure 3).

Hearing data were analyzed based on ABG values. The patients in the CSOM group had significantly worse mean ABG values before surgery (27.4 dB for the CSOM group vs 23.3 dB for the dry perforation group; \( P = .03 \)). Both groups closed their mean ABG value to less than 18 dB after surgery. The postoperative ABG values for the CSOM and dry perforation groups were not significantly different (\( P = .91 \)). Consequently, the improvement in the ABG value was significantly larger in the CSOM group (\( P = .01 \)) (Figure 4).

Available data regarding patients with more than 1 year of follow-up were collected, but the number available was too small for the data to be of any use. Therefore, reliable conclusions were not available for longer-term follow-up.

**COMMENT**

Despite the long-standing practice of performing mastoidectomy for CSOM without cholesteatoma, no convincing data in the literature indicate that mastoidectomy is always necessary for the treatment of CSOM. In fact, only 2 studies were found in the literature that attempted to compare the results of tympanoplasty with vs without mastoidectomy for CSOM without cholesteatoma. The results of these studies did not show any statistically significant difference. There are no randomized trials regarding this issue that we have been able to find in the literature. The studies that are available have different designs, objectives, and variable lengths of follow-up.

Mishiro et al\(^6\) compared their own surgical experience with and without mastoidectomy in CSOM and found no significant difference in graft success rates, regardless of otorrhea or whether computed tomography showed an antral block. In fact, their group formerly performed mastoidectomy but abandoned this practice for lack of scientific evidence in the literature and based on their own anecdotal clinical experience. Furthermore, they feel that performing mastoidectomy adds time, cost, and increased risk of postoperative complications.

Similarly, Balyan et al\(^7\) studied patients with CSOM, treated by means of tympanoplasty with and without mastoidectomy, and patients with current dry perforation with a history of CSOM treated with tympanoplasty alone. They found no significant difference in graft failure rates or hearing results compared with the literature, or any difference in outcome measures whether or not drainage was present. They also concur...
that the addition of mastoidectomy adds increased effort and risk to the surgery.

A study by McGrew et al7 examined the effect of mastoidectomy with canal wall up on 484 dry, postinfectious, unoperated, noncholesteatomatous TM perforations vs tympanoplasty alone. Their results showed identical perforation closure success rates of 91% in each group. Hearing results were also statistically insignificant. With a mean follow-up time of 32 months in each group, there were more subsequent procedures related to the original indication for surgery in the group that underwent tympanoplasty alone, but this was not statistically significant.

Because our study was not prospective or randomized, several potentially confounding factors were evaluated to reduce the possibility of bias. Overall, there were no significant differences in failure rate based on parameters of surgical approach, size of perforation, or age at surgery (see "Results" section for P values).

In our study, revision surgery was found to be a significant predictor of failure (P = .03), but there was no significant difference in distribution of this parameter between study groups (P = .08). Revision cases are thought to have poorer outcomes than primary cases, perhaps because these patients have intrinsic factors that increase the risk of failure after surgical treatment. Eustachian tube dysfunction is thought to be an important contributing factor to failure, although this idea is not proven in the literature. The resultant negative pressure and tension on the TM graft may contribute to reperforation. There may also be underlying intrinsic negative factors yet to be determined that may be present in some cases requiring revision surgery.

There are some data in the literature suggesting that the PA approach has superior results compared with the TC approach.8,9 There is a possibility that this parameter could have biased our results because there was a significantly higher number of TC approaches in the dry perforation group (P = .001). However, an analysis of our overall study population did not find this factor as a significant predictor of outcomes (P = .82).

Another difference between our study populations was perforation size. In the CSOM group, there were more large perforations (defined as ≥40% of the TM), which would be considered more difficult to correct, thereby favoring the dry perforation group. However, this parameter was not found to be a significant predictor of overall outcomes in our study population (P = .11).

Regarding hearing results, the preoperative mean ABG value was found to be significantly larger in the CSOM group (P = .03). Postoperative mean ABG values were equivalent in both groups, resulting in a significantly larger hearing improvement in the CSOM group (P = .01).

Our study data show that the short-term outcomes of performing tympanoplasty alone for the treatment of CSOM have statistically similar rates of failure as patients with dry perforations receiving the same treatment. There was no difference in the mean or median follow-up time overall between groups (36.9 weeks for CSOM vs 47.0 weeks for dry perforation) (P = .35). Both groups seemed to do well in the short-term after tympanoplasty alone. Long-term follow-up was not available in our study population. Based on our data, tympanoplasty performed for CSOM is at least as efficacious as tympanoplasty performed for dry perforations in the short term. There is a possibility that mastoidectomy performed for CSOM may be beneficial in long-term results, but this issue has not been directly addressed in the literature and is not addressed in this study.

In conclusion, this study shows that the short-term efficacy of tympanoplasty without mastoidectomy for the treatment of noncholesteatomatous TM perforation with various degrees of preoperative otorrhea is at least as efficacious as the same surgery performed for dry TM perforations without history of otorrhea. Longer-term follow-up would be needed to form any conclusions regarding results beyond 1 year.

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Author Contributions: Both authors had full access to all the data in the study and take responsibility for the integrity of the data and the accuracy of the data analysis. Study concept and design: Chang. Acquisition of data: Chang and Webb. Analysis and interpretation of data: Chang and Webb. Drafting of the manuscript: Chang and Webb. Critical revision of the manuscript for important intellectual content: Chang. Statistical analysis: Chang and Webb. Administrative, technical, and material support: Chang. Study supervision: Chang.

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REFERENCES