



Hearing outcomes after Mastoidectomy

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Abstract

Introduction: Mastoidectomy remains an important procedure for the management of some cases of chronic otitis media (COM). Our objective is to assess hearing results after canal wall up (CWU) and canal wall down (CWD) mastoidectomy.

Material and Methods: Retrospective review of mastoidectomies undertaken between 2012 and 2016 at a Portuguese hospital.

Results: 89 surgeries were analyzed. Both CWU and CWD mastoidectomies showed mean hearing gain of 7 dB. Cholesteatomatous COM was more common among surgeries which improved and which worsened hearing. However, proportion of noncholesteatomatous disease was significantly higher ($p=0.025$) in surgeries that deteriorated hearing.

Discussion/Conclusion: This study does not indicate any trend in order to solve the debate concerning the performance of mastoidectomy in cases of noncholesteatomatous COM. Nonetheless, option between CWU or CWD techniques should be not influenced by previous grade of hearing loss and presence or not of a contralateral functional ear.

Keywords:

Mastoidectomy; Chronic otitis media; Cholesteatoma; Hearing; Audiometry

Introduction

Mastoid surgery keeps wider relevance in the management of chronic otitis media (COM), in spite of the evolution of antibiotherapy [1]. In fact, active and inactive COM are considered part of a spectrum of otomastoiditis due to the anatomical connection of the tympanic cavity with the mastoid air cell system and, radiologically, severely diseased chronic ears frequently demonstrate evidence of diffuse mastoid air cell opacification and indicators of mastoiditis [2]. The possibility of intracranial complications reinforces the need, in some cases, for surgery [3]. Hearing preservation or restoration is another goal of this kind of surgery, but some controversy over several aspects. Namely, canal wall down (CWD) mastoidectomy tends to have lower recurrence rates but may preserve hearing function to a lesser extent than canal wall up (CWU) mastoidectomy [4].

With this study, the authors aim to evaluate the hearing outcomes with mastoidectomy and to compare the audiometric results between CWD and CWU techniques.

Materials and Methods

This study was a retrospective review of all patients undergoing mastoidectomy at Pedro Hispano's Hospital-Matosinhos, between January 2012 and December 2016. Data were collected until April 2018 and were obtained from the clinical records. Information retrieved from case records included

age, sex, surgical approach, pre-operative and post-operative audiometries, type of COM (cholesteatomatous or cholesteatomatous) and whether or not ossicular chain reconstruction was performed. Bilateral surgeries in the same patient were individually analyzed.

Exclusion criteria were previous cochlosclerosis in the operated ear, revision mastoidectomy and absence of audiometry after the sixth month of follow-up.

Surgical approach was divided in two groups: CWD and CWU mastoidectomies

In the audiometric evaluation, air conduction (AC) and bone conduction (BC) pure tone average (PTA)

Table 1: Types of tympanoplasty according to Portmann's classification.

Type	Description
I	Surgery to restore integrity of TM, with integrity of ossicular chain.
II	Surgery to restore integrity of TM, without integrity of ossicular chain, leading to interposition of partial ossicular replacement prosthesis.
III	Surgery to restore integrity of TM, without integrity of ossicular chain (only the base of stapes is present), leading to interposition of a total ossicular replacement prosthesis.

Results

There were 89 surgeries matching the inclusion criteria (63 CWU, 26 CWD). There were 44% female patients and 56% male patients. Mean age at timing of surgery (42 years old) was identical in CWD and CWU surgeries. Mean pre-operative ABG was 38 dB in the CWD group and 35 dB in the CWU group. Both groups showed a mean improvement of 7 dB after 6 months of follow-up. Only 15 surgeries (17%) worsened the ABG. BC-PTA thresholds remained unchanged. Among these 15 mastoidectomies, 2 were CWD (8% of these surgeries) and 13 were CWU (21% of these surgeries), but there was no statistically significant difference in the proportion of cases with worsened hearing in the CWU comparing to the CWD group. Mean ABG worsening was 12.5 and 13.4 dB, respectively. Near half of these surgeries (8) had simultaneous tympanoplasty with ossicular chain reconstruction: 1 CWD mastoidectomy with type III tympanoplasty (reconstruction with cortical mastoid bone), 3 CWU mastoidectomies with type II tympanoplasties (using titanium replacement prosthesis) and 4 CWU mastoidectomies with type III tympanoplasties (also using titanium prosthesis).

values were calculated as the mean of the hearing thresholds at frequencies of 0.5, 1, 2 and 4 kHz. Air-bone gap (ABG) was calculated as the difference between the AC-PTA and BC-PTA thresholds.

Type of tympanoplasty followed the Portmann's classification

Statistical analysis was conducted using statistical package for social sciences (SPSS), version 20.0.0. Independent samples t-test was used, with p-values of 0.05 or less considered statistically significant (Table 1).

On the one hand, 8 mastoidectomies for cholesteatomatous COM and 7 for noncholesteatomatous COM worsened hearing. On the other hand, 30 surgeries for cholesteatomatous COM and 8 for noncholesteatomatous COM improved hearing. Although cholesteatomatous disease was the most frequent in both situations, it had a significantly higher proportion of cases ($p=0.025$) among mastoidectomies which had better hearing outcome.

Discussion

There is an intense debate towards the regarding the use of mastoidectomy in cases of noncholesteatomatous middle ear disease [1,2,4-9]. Some authors argue that concurrent mastoidectomy (to tympanoplasty) subjects patients to increased risk and post-operative complications [6-9]. A study with 33 ears with COM and mastoid opacification at computed tomography showed that tympanoplasty alone resulted in improving of hearing in 85% of cases (mean of 15 dB). Only one patient (therefore, 3% of cases) had to be submitted to revision surgery with mastoidectomy to control infection. Moreover, extensive scar tissue formation with mastoidectomy

can lead to worsening of hearing [1]. In our study, there was mean hearing gain and hearing improvement cases were more frequent with mastoidectomy concomitant to tympanoplasty, both with cholesteatomatous and noncholesteatomatous COM. However, the proportion of cases with auditory worsening was significantly higher among noncholesteatomatous ears. Besides, 5 of 26 (19%) surgeries for noncholesteatomatous COM did not control otorrhea, so a second mastoidectomy was needed.

Classically, CWU mastoidectomy is associated with better hearing outcome [4,7]. Nevertheless, in this paper, pre and post-operative ABG were similar between CWU and CWD surgeries. Thus, as 7 of 63 (11%) CWU mastoidectomies required a second surgery and all of the CWD surgeries archived good control of infection, it may be plausible to indicate more patients, namely, with cholesteatomatous disease, for CWD mastoidectomy.

One limitation of this article is that there was no comparison with cases of noncholesteatomatous COM submitted only to tympanoplasty at our hospital. Another limitation is that 11 patients (operated after April 2016) completed less than 2 years of follow-up. Finally, total number of patients is somewhat low.

Conclusion

In our opinion, indication of mastoidectomy in cases of noncholesteatomatous CWU remains controversial and may be harmful in terms of

hearing outcome. Furthermore, hearing status of the patient is not a major criteria for the choice of mastoidectomy technique.

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