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# Results of Mastoidectomy in Elderly People with Chronic Otitis Media

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## Abstract

The ideal mastoid surgery consists of creating an infection-free ear and preserving its function, a procedure that is uncommon in the geriatric population. **Aims/Objectives**: To compare the postoperative results in adults and the elderly who underwent mastoidectomy, in addition to analyzing chronic diseases, smoking and anesthetic risk. **Material and Methods**: A cross-sectional study was carried out in patients aged 20-50 years and > 60 years with chronic otitis media (COM) submitted to mastoidectomy from January 2014 to December 2018. **Results**: 60 patients were selected, 35 adults and 25 elderly. Cholesteatoma OMC was predominant in 73.3% of cases and canal wall-up procedure was performed in 66.7% of procedures. The most prevalent comorbidity was systemic arterial hypertension. Only 30% of the patients did not present any type of postoperative complication. Canal wall-up technique had a higher rate of reoperation in adults than in the elderly ($p < 0.05$) and the average time for the next surgery was 1.74 years. The type of COM, comorbidities, smoking and anesthetic risk were not associated with disease recurrence and major complications in both groups. **Conclusion**: Mastoidectomy as a viable and safe alternative for the treatment of chronic otitis media in elderly patients.

**Keywords**: Cholesteatoma; Chronic Otitis Media; Elderly; Geriatric Otolaryngology; Mastoidectomy

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## Introduction

Chronic otitis media (COM) can generate a high social cost with repercussions on the quality of life of individuals, being part of the routine of otolaryngologists through the assessment of functional issues [1]. Its non-cholesteatomatous suppurative form refers to a perforation of the tympanic membrane with persistent otorrhea associated with blockage of communication between the antrum and epitympanum, generally without erosion of anatomical structures [2]. In chronic cholesteatomatous otitis media, on the other hand, we find a fetid and constant secretion, originating from keratinized squamous epithelium debris that can erode anatomical structures of the temporal bone [3].

The ideal mastoid surgery involves creating a dry, infection-free ear, completely removing lesions and maintaining maximum structure and function [4]. The canal wall down (CWD) technique removes the posterosuperior wall of the external auditory meatus, facilitating the intra- and postoperative visual field. However, its disadvantages are the need for regular cleaning and limitations for bathing [5]. In the canal wall up (CWU) technique, the posterior canal wall and tympanic membrane (TM) are preserved, without the need for water restriction, but on the other hand, there is a higher risk of recurrence [6, 7].

Regarding preoperative risk factors, age, anesthetic risk, comorbidities and smoking are extremely relevant. In 2020, for the first time in the world, people aged 60 and over will surpass the number of children under 5 years of age [8]. Thus, this process will require a transformation of health systems, driven by demands for specific care for this age group [9]. For an elderly person to be safely submitted to an intervention, it is necessary to carry out a comprehensive geriatric assessment, a basic protocol of geriatric semiology [10].

Despite such importance, population data are scarce and when we specify for surgical procedures, almost non-existent [11]. Mastoidectomy is an uncommon surgical procedure in the geriatric population and is generally reserved for those pathologies that cannot be treated conservatively [12]. Thus, the risk of the simplest to the most severe postoperative complications should also be considered, such as surgical wound infection, damage to the facial nerve, chronic imbalance, and permanent hearing loss, among others [13].

This study aimed to compare the rate of complications and the risk of reoperation between adults and elderly patients with COM undergoing mastoidectomy. In secondary analyses, assess demographic data, the presence of comorbidities or smoking and anesthetic risk classification (ASA) aiming to endorse the otorhinogeriatric literature.

## Materials and Methods

### Type and place of study

A cross-sectional observational study was carried out on patients with COM who underwent mastoid surgery between January 2014 and December 2018 in a hospital in São Paulo, Brazil.

### Inclusion and Exclusion Criteria

Patients who underwent primary mastoidectomy or late reoperation (period greater than 5 years) were included. Those who did not meet the age criteria were excluded - under 20 years (children and adolescents), those who had canceled surgeries or those who underwent subsequent surgeries in the same ear during the time of analysis were not included.

### Patients studied and data collection

The medical records of those individuals with a diagnosis of suppurative or cholesteatomatous COM were analyzed, divided into two groups: adults - 20 to 50 years and elderly - 60 years or more. We chose to disregard those included in the transition age group (6th decade), considered a period of aging by the WHO. Both epidemiological (gender, age and year of the procedure) and clinical (diagnosis, type of surgical technique, comorbidities, smoking, ASA and postoperative follow-up) data were listed and tabulated in a descriptive form for future statistical analysis.

Among the preoperative routine, basic laboratory tests, temporal bone computed tomography and auditory threshold measurement by tonal and vocal audiometry were collected, in addition to a preanesthetic evaluation with the hospital's own team to assess the surgical risk. Categorical variables were described using absolute and percentage relative frequency.

All surgeries were performed by the Otolaryngology service team, with the type of technique chosen based on the extent of the disease, mastoid characteristics, ossicular chain integrity, patient health and surgeon preference.

### Statistical analysis

Continuous variables were described using mean and standard deviation. The hypothesis of independence between two categorical variables was tested using Pearson's Chi-Square or Fisher's exact tests. The hypothesis of conditional independence between three categorical variables was tested using the Cochram-Mantel-Haenszel test or using the Log-Linear Model. The significance level adopted was 5% and the software used was the R Core Team 2020.

### Ethical considerations

The project was approved by the Research Ethics Committee of the HSPE and was exempted from the Informed Consent Term (FICF) as it involves analysis of records without direct contact with patients.

## Results

We reviewed 132 cases from the surgical history of the period and 60 patients met the inclusion criteria. The sample contained 35 (58.3%) individuals in the adult group (20 to 50 years old), while 25 (41.7%) corresponded to the elderly (over 60 years old). In addition, females were predominant with 61.7% (n=37) of the representatives in detriment of males with 38.3% (n=23).

As for the diagnosis, the presence of cholesteatomatous COM was observed in 44 (73.3%) cases, being higher also in the age groups separately, 74.2% in adults and 72% in the elderly. The option for CWU surgery occurred in 40 (66.7%) of the 60 procedures performed, and all cases of non-cholesteatomatous suppurative COM were approached by this more conservative alternative. The right side was affected in 55% (n=33) of the sample.

Regarding clinical data, Table 1 shows the categorical variables with their absolute and percentage relative frequencies. Most adults (22/35) presented ASA I classification according to anesthetic risk, while most elderly (21/25) had ASA II. Smokers (n=4) and ex-smokers (n=7) had a small portion with 81.7% (n=49) of the total being formed by non-smokers.

| | **20 - 50 years** | **+60years** | **Total** | **(%)** |
|---|---|---|---|---|
| **ASA** | | | | |
| I | 22 | 4 | 26 | (43,3) |
| II | 13 | 21 | 34 | 56,7 |
| **Comorbidities** | | | | |
| Yes | 10 | 21 | 31 | (51,7) |
| No | 25 | 4 | 29 | (48,3) |
| **Smoker** | | | | |
| Yes | 3 | 1 | 4 | (6,7) |
| Ex | 4 | 3 | 7 | (11,7) |
| No | 28 | 21 | 49 | (81,7) |
| **Reoperation** | | | | |
| Yes | 11 | 2 | 13 | (21,7) |
| No | 24 | 23 | 47 | (78,3) |
| **Complications** | | | | |
| Yes | 25 | 17 | 42 | (70,0) |
| Otorrhea | 12 | 12 | 24 | (40,0) |
| Fungal External Otitis | 2 | 0 | 2 | (3,3) |
| Operative Wound Infection | 5 | 2 | 7 | (11,7) |
| Granuloma/Polyp | 2 | 0 | 2 | (3,3) |
| Dysgeusia | 1 | 0 | 1 | (1,7) |
| Nausea | 1 | 0 | 1 | (1,7) |
| Pneumonia | 1 | 1 | 2 | (3,3) |
| Perforation of the Tympanic Membrane | 5 | 3 | 8 | (13,3) |
| Dizziness | 3 | 3 | 6 | (10,0) |
| Facial paralysis | 2 | 2 | 4 | (6,6) |
| Deep vein thrombosis | 1 | 0 | 1 | (1,7) |
| None | 10 | 8 | 18 | (30,0) |

**Table 1**: Frequency of clinical data by age group and total.

**Legend**: ASA: Anesthetic risk classification by the American Society of Anesthesiologists, n - absolute frequency. % - percentage relative frequency.

In terms of comorbidities, 67.7% of those who had some pathology that required chronic medication were elderly. The most prevalent found in descending order were: systemic arterial hypertension, diabetes mellitus, and dyslipidaemia/hypothyroidism. According to figure 1, hypertensive patients were also the most frequent when separated by age groups, in addition to demonstrating that all diabetic and dyslipidemic patients were over 60 years of age.

Only 30% of patients undergoing mastoid surgery did not present any type of postoperative complication. The most common was the presence of otorrhea reported within 6 months of postoperative follow-up in 24 (40%) patients. Then, we found TM perforation (13.3%), surgical wound infection (11.7%) and dizziness (10%) as the most common. Of the 4 cases of peripheral facial paralysis, 2 already presented it in the preoperative period with transient worsening in the post-operative period, 1 was later diagnosed with a skull base tumour and the other was undergoing the fourth surgery in the same ear. Hypoacusis and audiometric data were not evaluated in this study.

Regarding the need for re-approach and the presence of complications, there was no statistical significance (p>0.05) related to the variables: type of COM, comorbidities, smoking and ASA. When including the age group in this analysis, the same outcome was observed. However, it is noteworthy that 25% (11/44) of patients with middle ear cholesteatoma required a new surgery, while only 12.5% (2/16) of patients with suppurative COM had recurrence. (Tables 2 and 3).

| | COM | | |
|---|---|---|---|
| | **Cholesteatomatous n (%)** | **Non-cholesteatomatous suppurative n (%)** | **p-valor** |
| **21-50 years** | | | |
| **Reoperation** | | | |
| Yes | 9 (81,8) | 2 (18,2) | 0,685 |
| No | 17 (70,8) | 7 (29,2) | |
| **Complications** | | | |
| Yes | 17 (68) | 8 (32) | 0,235 |
| No | 9 (90) | 1 (10) | |
| **+ 60 years** | | | |
| **Reoperation** | | | |
| Yes | 2 (100) | 0 (0) | 1,000 |
| No | 16 (69,6) | 7 (30,4) | |
| **Complications** | | | |
| Yes | 12 (70,6) | 5 (29,4) | 1,000 |
| No | 6 (75) | 2 (25) | |
| **Total** | | | |
| **Reoperation** | | | |
| Yes | 11 (84,6) | 2 (15,4) | 0,481 |
| No | 33 (70,2) | 14 (29,8) | |
| **Complications** | | | |
| Yes | 29 (69) | 13 (31) | 0,346 |
| No | 15 (83,3) | 3 (16,7) | |
| **Reoperation Complications** | 0,516<br>0,411 | | |

**Table 2**: Rate of reoperation and complications according to the type of chronic otitis media.

**Legends**: n - absolute frequency. % - percentage relative frequency. F: Fisher's exact test. CMH: Cochram-Mantel-Haenszel Test.

| | **Tympanomastoidectomy technique** | | | **ASA** | | |
|---|---|---|---|---|---|---|
| | **CWD n (%)** | **CWU n (%)** | **p-valor [F]** | **I n (%)** | **II n (%)** | **p-valor [F]** |
| **21-50 years** | | | | | | |
| **Reoperation** | | | | | | |
| Yes | 0 (0) | 11 (100) | **0,033** | 8 (72,7) | 3 (27,3) | 0,478 |
| No | 9 (37,5) | 15 (62,5) | | 14 (58,3) | 10 (41,7) | |
| **Complications** | | | | | | |
| Yes | 5 (20) | 20 (80) | 0,393 | 18 (72) | 7 (28) | 0,123 |
| No | 4 (40) | 6 (60) | | 4 (40) | 6 (60) | |
| **+ 60 years** | | | | | | |
| **Reoperation** | | | | | | |
| Yes | 0 (0) | 2 (100) | 0,487 | 1 (50) | 1 (50) | 0,300 |
| No | 11 (47,8) | 12 (52,2) | | 3 (13) | 20 (87) | |
| **Complications** | | | | | | |
| Yes | 8 (47,1) | 9 (52,9) | 1,000 | 2 (11,8) | 15 (88,2) | 0,570 |
| No | 3 (37,5) | 5 (62,5) | | 2 (25) | 6 (75) | |
| **Total** | | | | | | |
| **Reoperation** | | | | | | |
| Yes | 0 (0) | 13 (100) | **0,003** | 9 (69,2) | 4 (30,8) | 0,056 |
| No | 20 (42,6) | 27 (57,4) | | 17 (36,2) | 30 (63,8) | |
| **Complications** | | | | | | |
| Yes | 13 (31) | 29 (69) | 0,564 | 20 (47,6) | 22 (52,4) | 0,398 |
| No | 7 (38,9) | 11 (61,1) | | 6 (33,3) | 12 (66,7) | |
| Reoperation | **0,002 [CMH]** | | | 0,379 [CMH] | | |
| Complications | 0,807 [CMH] | | | 0,489 [CMH] | | |

**Table 3**: Reoperation rate and complications according to surgical technique and anesthetic risk.

**Legend**: CWD: Canal wall down, CWU: Canal wall up, ASA: Anesthetic risk classification by the American Society of Anesthesiologists, n - absolute frequency. % - percentage relative frequency. F: Fisher's exact test. CMH: Cochram-Mantel-Haenszel Test.

Regarding the surgical technique, the reoperation rate was higher in the total sample and for the specific age group of 20-50 years and was strongly associated with CWU mastoidectomy ($p<0.05$). In addition, of the 13 patients who required a new procedure, 11 (84.6%) had a diagnosis of cholesteatoma and the mean time to the next surgery was 1.74 years (20.8 months).

## Discussion

The present study aimed to evaluate the rate of complications and disease recurrence among 60 patients, divided into adults (20-50 years) and elderly (> 60 years), with chronic suppurative or cholesteatomatous otitis media who underwent mastoidectomy. The data found are expressive representatives of what is observed in other surgical care centers.

Twenty-five elderly people who met the inclusion criteria were selected, and 72% of them were diagnosed with middle ear cholesteatoma in anatomopathological samples collected intraoperatively. Mirigov et.al. Carried out a study in 2009 to study the conditions that led 27 elderly people to undergo mastoidectomy, also finding cholesteatomatous COM as the main cause, in 59.3% of cases [12].

Many classifications of middle ear and mastoid surgery have been proposed over the years. However, there is no standardization of nomenclatures and technical variations [14]. Here we use the general terms CWU and CWD since other subtypes such other subtypes such as subcortical mastoidectomy and modified radical mastoidectomy occurred in insufficient numbers for a more detailed analysis.

The CWU technique was the choice in 66.7% (n=40) of cases, with systemic arterial hypertension being the most common comorbidity and 48.3% having no comorbidity. In a similar study in South Korea, 86.2% of the elderly performed the closed technique, hypertensive individuals were also more prevalent among clinical diseases and a total of 49.4% of these had no previous health problem [15].

It is logical to conclude that the elderly have a higher anesthetic risk and consequently a higher number in the ASA classification than younger people. What is worth emphasizing is that the physiological changes resulting from aging even in a healthy adult must be considered when administering anesthetic care to the geriatric population [16]. Furthermore, although the demographic change is known, the great increase in the demand for otolaryngologists with experience in the care of the elderly contrasts with the little attention that this specific division has received in our environment [17].

The vast majority of the population in this study (49/60) were non-smokers. Thus, it was not possible to significantly assess whether this variable could bring different results in the post-surgical follow-up. Kay-Rivest et.al (2019) stated that smokers undergoing ear surgery are more likely to have infections and wound dehiscence, although they are rare, with a rate of just over 2% of the total [18].

Usually, auditory thresholds, complications and recurrence rates are used to compare results after middle ear and mastoid surgeries. With specific regard to complications, 70% of patients presented, in descending order of appearance: otorrhea, tympanic membrane perforation, surgical wound infection and dizziness. However, the occurrence of adverse events and disease recurrence was not related to the type of COM, comorbidities, smoking and anesthetic risk. Further studies are needed to assess whether complications individually and whether hearing thresholds are also not affected by these variables.

Closed mastoidectomy is generally indicated for cases of primary and limited disease, justifying its predominance in our study, since we accounted for primary surgeries or late reoperations (period greater than 5 years) and we did not account for subsequent surgeries on the same patient. In line with existing research, it is associated with relapse rates of 20% to 60% [19]. In addition, cholesteatomatous COM was detected in 84.6% of those who had recurrence. This topic usually requires epidemiological research with large cohorts and long follow-up periods for a better understanding of this phenomenon [20].

Although this is not the objective of this article, a factor that draws attention to another work would be the lack of tools to assess the postoperative quality of life in those undergoing this type of surgery [6]. Although it has been shown that there is no difference between closed and open mastoidectomy, the application of specific questionnaires to assess pain, otorrhea, the number of returns and the psychological aspects of the sequelae in the elderly with chronic otitis media would be enriching for the otorhinogeriatric literature.

Among the limitations presented in this study, we can highlight the loss of data due to failure and difficulty in understanding the notes in manual medical records and the loss of follow-up in some postoperative visits. Added to this is the lack of audiometry records, making the study of pre- and post-surgical auditory thresholds unfeasible.

## Conclusion

The CWU tympanomastoidectomy technique was more associated with surgical failure and disease recurrence, with greater need for new surgery in adults aged 20-50 years than in those aged > 60 years. It was also possible to verify that the older age group did not present a greater risk of reoperation or post-mastoidectomies complications, despite having a higher classification of anesthetic risk and presenting more comorbidities. In addition, the type of OMC and the fact of being a smoker or ex-smoker were also not decisive for the results. Thus, we can consider mastoidectomy as a viable and safe alternative for the treatment of COM in elderly patients.

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