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ORIGINAL ARTICLE

The 10-Year Disease-Free Rate of Attic Cholesteatoma Based on a New Staging System

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Objective: To investigate the 10-year disease-free rate of attic cholesteatoma based on the new staging system established by Japan Otological Society (JOS).

Materials and Methods: It is a retrospective study and performed in a tertiary referral and academic center. The series comprised 87 patients with attic cholesteatoma who underwent surgical treatment by a single surgeon between 1994 and 1999.

The 10-year disease-free rate of attic cholesteatoma based on the JOS staging system was calculated using Kaplan-Meier survival analysis.

Results: The 10-year disease-free rate of attic cholesteatoma was 81.4% overall, 100% in Stage I, 75.4% in Stage II and 90.9% in Stage III.

Conclusion: The JOS staging system reflected the prognosis of cholesteatoma to some extent. However, further discussion is necessary to expand the use of this staging system. The development of a common international staging system for cholesteatoma in the future is desirable.

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Introduction

The rate of cholesteatoma recurrence depends upon the follow-up periods, surgical methods, surgical technique, extension of cholesteatoma and method of statistical analysis. We previously reported that the rate of cholesteatoma recurrence increased during long-term follow-up and that Kaplan-Meier survival analysis should be used to calculate the rate of cholesteatoma recurrence.[1] Meanwhile, we also reported that canal wall down tympanoplasty (CWDT) showed a better long-term prognosis than intact canal wall tympanoplasty (ICWT) and canal wall reconstruction (CWR) after CWDT.[1] However, there has not been a common staging system established to evaluate the extension of acquired cholesteatoma similar to the UICC TNM classification for cancer. Japan Otological Society (JOS) advocated a staging system for attic cholesteatoma in 2008.[2] In this article, we describe the 10-year disease-free rate of attic cholesteatoma based on this new staging system.

Materials and Methods

This series consisted of 87 patients with attic cholesteatoma who underwent surgical treatment by a single surgeon (Y.M.) between 1994 and 1999. Table 1 lists the demographic and clinical characteristic of the patients. The 10-year cumulative disease-free rate based on the JOS staging system was calculated using Kaplan-Meier survival analysis. Table 2 lists the JOS staging system. We used SPSS version 11.0J statistical software (SPSS Inc, Chicago, Illinois) to perform the analysis.

Table 1. Demographics and Clinical Characteristics of 87 attic cholesteatomas

Gender	Male: 57 (66%)
	Female: 30 (34%)
Mean age at surgical treatment	50y (6-72y)
Median follow-up periods	8y (3m-15y9m)
Stage	Stage I: 11 (13%)
	Stage II: 64 (74%)
	Stage III: 12 (14%)

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Table 2. The Japan Otological Society Attic Cholesteatoma Staging System

Stage I	Cholestetaoma that does not extend beyond the attic
Stage II	Cholesteatoma that extends beyond the attic
Stage III	Any cholesteatoma causing at least one of the following complications 1. Facial palsy 2. Intracranial complications 3. Labrynthine fistulae 4. Large defect of bony external ear canal* 5. Profound sensorineural hearing loss** 6. Total adhesion of the ear drum

**: Larger than half of the bony external ear canal*

***: Scale out of bone conduction thresholds in either 0.5, 1, 2 kHz*

Results

Based on the JOS staging system, 11 patients (13%) were included in Stage I, 64 patients (74%) in Stage II, 12 patients (14%) in Stage III. All of the recurrent cases in Stage II were recurrent cholesteatoma, while those of Stage III were residual cholesteatoma. Table 3 lists surgical methods performed in the individual Stage. The overall 10-year cumulative disease-free rate was 81.4% (Figure 1). The 10-year cumulative disease-free rate was 100% in Stage I, 75.4% in Stage II, and 90.9% in Stage III (Figure 2). Stage II showed a worse prognosis than Stage III.

Table 3. Surgical methods performed at individual Stages

	TCA	ICWT	CWR	CWR with MO	CWDT	Total
Stage I	4	4	1	1	1	11 (13%)
Stage II	1	9	17	17	20	64 (74%)
Stage III	0	2	1	5	4	12 (14%)
Total	5 (6%)	15 (17%)	19 (22%)	23 (26%)	25 (29%)	87

TCA: Transcanal atticotomy

ICWT: Intact canal wall tympanoplasty

CWR: Canal wall reconstruction after canal wall down mastoidectomy

MO: Mastoid obliteration

CWDT: Canal wall down tympanoplasty

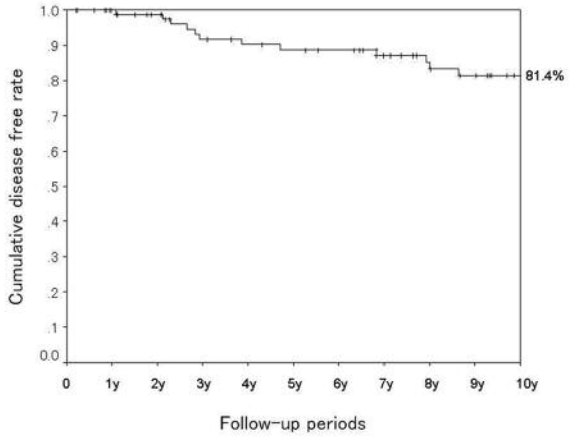

Figure 1-The overall 10-year cumulative disease-free rate

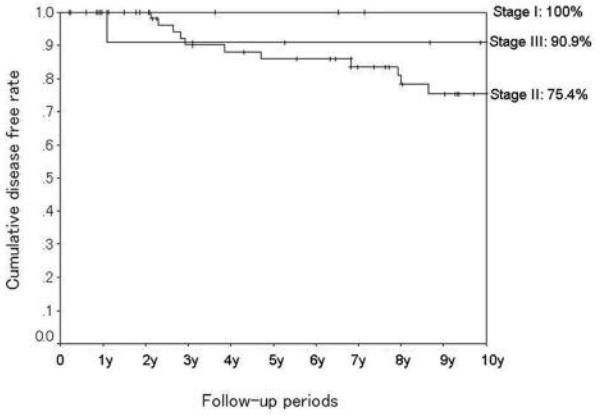

Figure 2- The 10-year cumulative disease-free rate of individual Stages

Discussion

The rate of cholesteatoma recurrence depends upon the follow-up periods, surgical methods, surgical technique, extension of cholesteatoma and method of statistical analysis. There have been many reports concerning the cholesteatoma recurrence rate, but in most reports, this rate was calculated using the standard recurrence rate in various follow up periods.[3-9] There have been only a few reports using Kaplan-Meier survival analysis.[1,10,11] Stangerup et al.[10] compared recurrence rates using several statistical methods. They reported that the recurrence rate a¥varied from 30 to 67%, and the standard rate showed the lowest recurrence rate. The concluded that the incidence by the risk method (Nelson-Aalen), actuarial survival analysis, or Kaplan-Meier survival analysis should be used in cases involving censored data. Therefore, we used Kaplan-Meier survival analysis in this article.

Meanwhile, concerning congenital cholesteatoma, Potsic et al.[12] proposed a new staging system in 2002. This staging system has been widely used.[13,14] However, for acquired cholesteatoma, there has not been a common staging system to evaluate the extension of cholesteatoma similar to the UICC TNM classification. JOS proposed a new staging system for attic cholesteatoma in 2008.[2] Stage I indicates a small cholesteatoma that does not extend beyond the attic (Figure 3). Most patients in Stage I have a normal ossicular chain and normal hearing. The 10-year cumulative disease-free rate of Stage I was 100% in this series, indicating that there has not been any recurrence in Stage I. However, it remains controversial whether small cholseteatoma such as those in Stage I, especially in patients with normal hearing should be surgically treated. Stage III indicates any cholesteatoma demonstrating at least one complication. Since Stage III indicates an advanced cholesteatoma, CWDT or CWR with mastoid obliteration was performed for 75% of Stage III patients (Table 3). However, the range of Stage II is too wide (Figure 4) and 74% of patients in this series were included in Stage II. Furthermore, a variety of surgical methods were performed in Stage II (Table 3). This is the reason Stage III showed a better prognosis than Stage II. Further discussion is necessary to expand the use of this staging system. However, the development of a common international staging system for cholesteatoma in the future is desirable.

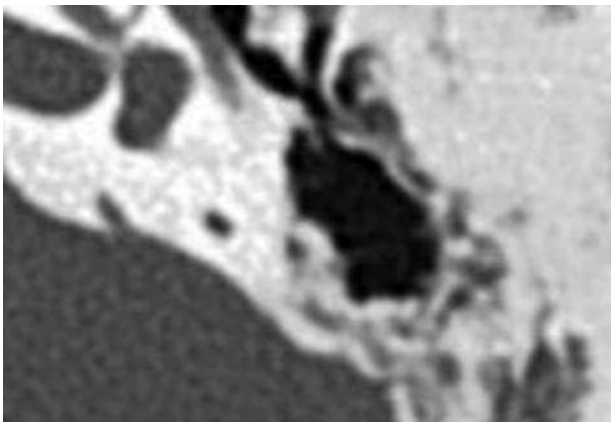

Figure 3- CT scan finding of Stage I (Cholesteatoma not extending beyond the attic)

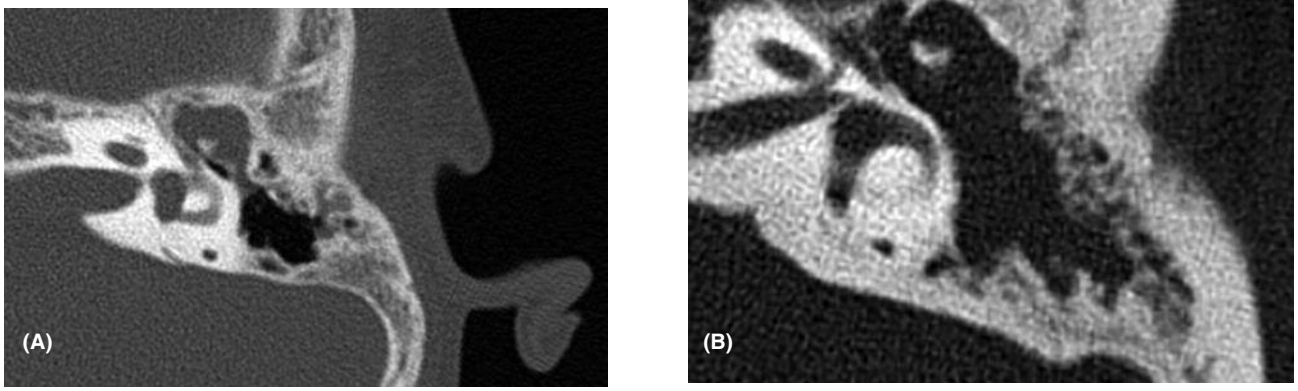

Figure 4.A - The antrum showed partial aeration. **B-** The antrum was totally occupied by cholesteatoma

Conclusion

The 10-year cumulative disease-free rate of atic cholesteatoma based on this new staging system was 81.4% overall, 100% in Stage I, 75.4% in Stage II, 90.9% in Stage III. The JOS staging system for attic cholesteatoma reflected the prognosis of cholesteatoma to some extent, but further discussion is necessary to expand the use of this staging system. The development of a common international staging system for cholesteatoma in the future is desirable.

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