Ear Clinics International

VOLUME 2

Clinical Problems in Otitis Media and Innovations in Surgical Otology

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Editors

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VOLUME II

Clinical Problems in Otitis Media and Innovations in Surgical Otology

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Clinical Problems in Otitis Media and Innovations in Surgical Otology

This volume is one of the series
Ear Clinics International

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Other books in this series include:

Paparella and Meyerhoff: Sensorineural Hearing Loss, Vertigo and Tinnitus

Paparella and Meyerhoff: Clinical Otology

Preface

This, the Second Volume of Ear Clinics International is organized separately but predicated on an International Symposium on Clinical Problems in Otitis Media and Innovations in Surgical Otology, held in Santiago, Chile, December 11–13, 1980. This volume continues to incorporate ecumenical participants and points of view. Thus, there is no attempt to be uniform or consistent but rather to combine varying opinions from individuals from different cultures and countries.

In the first section, "Fundamental Otitis Media Concepts," basic science aspects and medical principles are discussed by various authors.

The second section, "Cochlear and Audiological Concepts," contains contributions on impedance audiometry, acoustic tumor diagnosis, tinnitus its diagnosis and treatment, the controversial question of diabetes mellitus and its affects on the inner ear and concepts of hearing aid usage.

"Surgical Concepts in Otology," the third section, includes discussants from Europe, Latin America, as well as the United States. Topics include vertigo, a test for Bell's Palsy, retrolabyrinthine tumors, congenital atresia, and tympanic neurectomy for drooling. Major emphasis in this section are on different methods of otosclerosis surgery and otitis media surgery. Considerations of diagnosis, surgical techniques and complications are discussed.

It is the editor's fervent hope the reader will enjoy learning these varied points of view and this, the Second Volume of Ear Clinics International, will contribute further to international goodwill and mutual respect and understanding between all of us irrespective of our cultural and political backgrounds.

We are aware of international political realities that exist especially between countries in Latin America and the United States and others. It becomes even more important that people of goodwill and intentions build bridges of cooperation and strive for common goals. As demonstrated in this volume, Otologists, have the capacity for doing this very well. They can, through learning experiences such as this, develop a better understanding for each other which helps, we believe, reduce political tensions between countries.

Finally, as Dr. Pollak, a Lion as well as an Otolaryngologist describes in the addendum, we were pleased to have the participation of Lions not only from the United States but from Chile. It is heartening to see Lions Hearing Centers evolve in other countries to serve the needs of those societies in cooperation with Otologists in those communities.

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Contents

CHAPTER 1

Tinnitus Maskers

Earl R. Harford, Ph.D.

In the past few years, there has been increasing interest in the use of electronic devices specifically designed and built for the amelioration of tinnitus. These devices are electronic generators, housed in hearing aid cases, that produce a band of noise that is intended to mask the user's tinnitus. Commercial tinnitus maskers generate broad and narrow bands of noise at output levels of 75 to 105 dB SPL. Ultra high frequency maskers produce about 55 dB SPL from 2 to 15 kHz for patients with high frequency tinnitus. Some maskers have discrete frequency noise band adjustments, usually high, low and mid-frequency band-pass filters. There are instruments available that contain just a masking stimulus and others that consist of a hearing aid plus a masker. The former are called tinnitus maskers and the combination units are referred to as tinnitus instruments. In the fall of 1980, there were at least four manufacturers of tinnitus masking devices in the United States. These companies produced a total of about 17 different models (1).

The use of masking to treat tinnitus is not a new concept. An electronic device, however, that produces an acoustic stimulus especially tailored to mask a patient's tinnitus is a new concept. Ever since Vernon (2) described a clinical procedure for evaluation of tinnitus and use of masking to treat the symptom in 1976, the use of maskers has received considerable attention.

There is no standardized clinical procedure for evaluating tinnitus and for establishing a prognosis for success from a masker. In the spring of 1978, we developed a Tinnitus Clinic at the University of Minnesota Medical School and wish to share some of our experiences in this presentation. We will also draw from the experiences of others that have reported in the literature. Our Tinnitus Clinic has four major components: 1) the neuro-otologic/audiologic diagnosis, 2) the tinnitus evaluation, 3) trial use of masking device, and 4) professional follow-up counseling.

DIAGNOSIS

Tinnitus should always be considered initially as a neuro-otologic symptom that must be carefully evaluated to rule out a treatable disease and/or a life-threatening disorder of the central nervous system. Dr. Meyerhoff has treated this subject effectively in Sensorineural Hearing Loss, Vertigo, and Tinnitus (Volume I of Ear Clinics International Series). Once the neuro-otological and audiological evaluation has been completed and the decision made to investigate the treatment of the tinnitus with a masker, the next step is to evaluate the tinnitus, per se. The patient may or may not have a hearing loss. If there is a hearing loss that interferes with speech communication, it is wise to investigate the use of a hearing aid before, or in lieu of, a tinnitus evaluation. A hearing aid often provides relief from tinnitus while simultaneously improving the patient's communicative efficiency. We routinely explore regular hearing aid use before a special tinnitus masking device, even if the patient has just a mild hearing loss. The content of this chapter focuses on patients with tinnitus who are not helped by, or do not warrant, a conventional hearing aid.

TINNITUS EVALUATION

Our tinnitus evaluation consists of five parts: 1) history, 2) pitch matching, 3) loudness matching, 4) masking, and 5) residual inhabition testing. The first step in the tinnitus evaluation is to obtain a careful

history. Our current form is included at the end of this chapter. We have found that there are certain key questions on this form that correspond with the acceptance and success of a tinnitus masker. In particular, the greater the annoyance and handicap the tinnitus imposes on the patient, the more likely a tinnitus masker will be useful. Obviously, this principle applies to most prosthetic devices. Consequently, we often use this tinnitus history form as a screening mechanism for patients who write, call the Clinic, or come in with some other chief complaint of the ear, head, or neck and subsequently learn about our Tinnitus Clinic. This history form requires that the patient think carefully about the annoyance and nature of his or her tinnitus. Some patients conclude that the tinnitus really is not very much of a problem after completing the history. We do not encourage patients to investigate tinnitus masking unless the problem has been present for a year or longer. If tinnitus persists for more than one year and the patient has failed to cope with it effectively, we believe that the investigation of a tinnitus masker is indicated.

The second step in our tinnitus evaluation is to present the patient with various acoustic stimuli in an effort to obtain a pitch match. High pitched tinnitus is most common among our patients which supports the reports of Vernon (5) and Roeser and Price (6). Vernon states that 63% of his patients have tinnitus between 2 and 7 kHz. Only 21% located it below 2 kHz and 16% above 7 kHz.

The third step is to obtain a loudness match of the tinnitus, using the same stimulus as that used for the pitch match. The loudness of tinnitus can be misleading from the history. Even though the majority of patients report that their tinnitus is loud, most persons match loudness just a few decibels above the threshold of the stimulus that sounds like their tinnitus. Stated differently, the physical intensity of most tinnitus is not nearly as loud as the patient subjectively reports. Roeser and Price (6) report that 77% of their group of 83 patients matched the loudness of their tinnitus within a 10 dB sensation level.

Tinnitus matching is easily accomplished by many patients. There are some patients, especially those with central tinnitus, who find that matching their tinnitus to an external stimulus is a very difficult or impossible task. In the recent past, we have been using a tinnitus analyzer designed by Voroba (4). This instrument utilizes a clinical application of the psychophysical method of adjustment, i.e. the patient controls the stimuli produced by the analyzer and performs a tinnitus match. Even though a standard clinical audiometer with variable narrow bands of noise can be used to assess the pitch and loudness of tinnitus, we find this tinnitus analyzer a more effective and reliable clinical tool for evaluating the nature of tinnitus.

The fourth step in the evaluation is to determine whether or not the patient's tinnitus can be masked, and if so, how much sound pressure is required to "cover" the tinnitus. There are some patients whose tinnitus cannot be masked by any signal, while others experience partial masking (mainly reduction in loudness and/or change in quality) of their tinnitus. Those with a severe hearing loss, particularly in the frequency range of the tinnitus, and those with central tinnitus, are the most difficult to mask.

The fifth step in our tinnitus evaluation is to determine whether the tinnitus disappears completely or partially following a one-minute stimulation of the ear with a masking noise at a 10 dB sensation level relative to the minimum masking level. Vernon (5) reports that 78% of his patients claim to experience partial (65%) or complete (35%) relief from their tinnitus following a one-minute stimulation. He refers to this phenomenon as residual inhabition. Total residual inhabition can be a very dramatic and emotional experience for a patient who has severe and constant tinnitus.

WEARABLE TINNITUS MASKER

If the tinnitus evaluation indicates that the patient may benefit from a wearable tinnitus masker, the next logical step is to fit the patient with such a device. We must

meet three conditions before trying a masker:

1. The patient must be very disturbed by the tinnitus (7 or higher on the severity scale on item #20 on the history form) and highly motivated to obtain relief.
2. The masking stimulus must be acceptable to the patient. That is, the stimulus used to mask the tinnitus should not be worse than the tinnitus itself.
3. It was possible to partially or completely mask the patient's tinnitus during the evaluation.

When these three conditions are met, we fit the patient with a tinnitus masker that produces a noise band in the frequency range of the tinnitus. The fitting is followed by trial use of the masker to determine if the patient is able to learn to ignore the masker. If passive relief (residual inhabition) occurs after the masker is removed, we believe this is an extra dividend that the patient gains from the masker. In our opinion, the best way to explore the use of a masker is to allow the patient to actually use such a device on a daily basis for at least one month under careful professional surveillance and guidance.

DISCUSSION

Degree of success with tinnitus maskers varies in the literature. In a preliminary study Vernon and Scheuning (7) report that 81% of their patients were obtaining relief from tinnitus masking. Roeser and Price (6) report only 26% of their patients report help from a masker. Rose (8) reports findings similar to Roeser and Price and our experiences are also consistent with those of Roeser and Price. Table 1.1 summarizes the most current (at the time of this writing) data on the largest sample on a follow-up of tinnitus maskers. Note that patients who used masking instruments report the highest degree of success. This could be the result of improved hearing rather than relief from tinnitus. Recall that

Table 1.1
Results of a Follow-Up Survey of 380 Tinnitus Patients Seen from 1976 through 1978 who were Provided Specific Recommendations to Participate in the Masking Program[a]

	Maskers		Hearing Aids		Tinnitus Instruments		Totals	
	No.	%	No.	%	No.	%	No.	%
Recommended for trial purchase	204		132		44		380	
Purchased device	93	46	91	69	32	73	216	57
Currently wearing device	61	30 (66)[b]	68	52 (75)	29	66 (91)	158	42 (73)
Tried device but did not purchase	58	28	17	13	5	11	80	37
Duration wearing unit								
Less than 1 year	37	40	24	26	12	38	73	34
Less than 2 years	43	46	32	35	12	38	87	40
More than 2 years	13	14	35	39	8	24	56	26
Relief								
Total	6	6	2	2	2	16	13	6
Partial	69	74	39	43	22	68	130	60
None	18	19	50	55	5	16	73	34

[a] Reprinted with permission from A. J. Schleuning, R. M. Johnson, and J. A. Vernon: *Ear & Hearing* 1: 71–74, 1980.
[b] Numbers in parentheses, percentages for those patients who purchased instruments and are currently wearing them.

tinnitus instruments are a combination of a hearing aid and masker in the same ear.

What is not reflected in the data in Table 1.1 and in most reports is the favorable effect that a Tinnitus Program or Clinic has on patients who suffer from tinnitus. The majority of our patients have been told in the past that nothing can be done for it and that they had to learn to live with it. Many had been told that the cause is unknown. Patients are seen in our Clinic for a careful neuro-otologic diagnosis. Those with hearing loss receive comprehensive hearing health care, many get hearing aids, while others experience emotional relief to learn that their tinnitus is not a sign of a tumor or life-threatening disease. Stated differently, a specific clinical activity that focuses on the symptom of tinnitus can do much to help patients by reducing stress from the bewilderment, anxiety, and discomfort of tinnitus. Tinnitus masking per se is not a panacea, but in our opinion, it has a viable role in a comprehensive hearing health care program.

The use of masking devices is being promoted as an effective therapeutic procedure in the lay media and in a few isolated reports in the scientific and professional literature. There is still inadequate evidence in the scientific literature that maskers are a viable therapeutic device for the relief of tinnitus.

In mid-1977, the U.S. Food and Drug Administration placed tinnitus maskers in Class III. Devices in this classification are considered to present a potential unreasonable risk to a patient and lack sufficient evidcence of their safety and effectiveness. Because they were available to the public prior to this FDA declaration, manufacturers have been allowed 30 months to demonstrate the safety and effectiveness of these devices. There are many questions about tinnitus maskers that have not been answered. Probably the more significant questions are: 1) What is the long-term acceptance of tinnitus maskers by persons with tinnitus? 2) Can long term exposure to a tinnitus masker exacerbate tinnitus and/or cause a permanent hearing loss? Vigorous research in months ahead should provide the answers to these and many other questions about tinnitus masking. In the meantime, we shall continue to use masking devices with our selected patient population on a careful and systematic basis. We also plan to engage in collaborative research on this subject with colleagues.

UNIVERSITY OF MINNESOTA HOSPITALS

AUDIOLOGY CLINIC

TINNITUS HISTORY

(Please print clearly)

NAME: _____ DATE: _____

ADDRESS: _____ PHONE: Home _____

_____ Work _____

Birth Date _____ Age _____

Month Day Year

Type of Work: Current _____ Former _____

Length of time employed at current job: _____ Former _____

Please complete the following questions:

1. Have you seen a medical doctor about your tinnitus before coming here? Yes ___ No ___

   If yes, please supply the following information:

   Physician's name _____

   Location _____

   Date of Examination _____

   What were you told? _____

   _____

2. Are you currently under a physician's care for your tinnitus? Yes ___ No ___

3. Do you have any of the following? (circle the appropriate letter or letters)
   a. high blood pressure
   b. diabetes
   c. allergies
   d. other significant medical problem(s) _____

4. Are you taking any medication at this time? Yes ___ No ___
   If yes, what medications? _____

5. Do you smoke tobacco? Yes ___ No ___
   If yes, for how long have you been a smoker? ___ years
   If yes, how many (cigarettes, cigars, pipes) do you smoke per day? _____

6. Do you drink coffee? Yes ___ No ___ Cups per day ___ (approximately)
   tea? Yes ___ No ___ Cups per day ___ (approximately)
   cola? Yes ___ No ___ Heavy ___ Moderate ___ Very little ___
   alcohol? Yes ___ No ___ Heavy___ Moderate ___ Very little ___

7. Do you take aspirin regularly? Yes ___ No ___ If yes, how much ___

8. Have you ever sustained a head injury? Yes ___ No ___ Mild ___ Severe ___
   Were you knocked unconscious? Yes ___ No ___
   How old were you at time of accident? ___ years
   Did any significant problem result, such as frequent headaches, ear or eye problems, etc.? Yes ___ No ___ Please explain _____

9. Have you been exposed to unusually loud sounds? Yes ___ No ___
   Explain briefly _____

10. Are you presently working in, or exposed to, loud sounds? Yes ___ No ___
    Explain briefly _____

11. Do you wear ear protection in the presence of loud sounds? Yes ___ No ___
    If yes, what type _____

12. Do you have a history of ear disease? Yes ___ No ___
    Please explain _____

13. Do you have a hearing loss? Yes ___ No ___ Possible ___ Don't Know ___
    If yes, right ear? Yes ___ No ___
    left ear? Yes ___ No ___

14. Have you ever worn a hearing aid? Yes ___ No ___
    If yes, do you currently wear it? Yes ___ No ___

15. If you are a hearing aid user, how does the aid affect your tinnitus?
    a. makes tinnitus less bothersome
    b. makes tinnitus more bothersome
    c. other _____

16. I first noticed my tinnitus _____

17. I have had tinnitus in its present form for:
    a. less than a year
    b. one to two years
    c. two to three years
    d. three to five years
    e. since 19__

18. Prior to my present form of tinnitus, I had:
    a. no tinnitus
    b. a different type of tinnitus
    c. a mild form of my present tinnitus

19. My tinnitus seems to be primarily located in:
    a. the left ear
    b. the right ear
    c. both ears equally
    d. both ears but equally
    e. within my head but at no specific location
    f. outside my head

20. When my tinnitus is at its worst, I would describe its severity to be represented by the number __ according to the scale shown below:

1	2	3	4	5	6	7	8	9	10
mild tinnitus (occasionally noticeable but not disturbing)				moderate severity (always noticeable but does not disrupt my everyday activities)			extremely severe (I am seriously disabled by it)		

21. The loudness of my tinnitus is:
    a. usually the same
    b. fluctuates widely, being very loud on some days and very mild on others
    c. usually constant but on rare occasions will decrease markedly

22. The loudness level of my tinnitus is best compared to:
    a. the loudness of a jet aircraft taking off
    b. the loudness of a diesel truck motor at close range
    c. the loudness of a jackhammer at close range
    d. the loudness of an electric fan at close range
    e. other _____

23. On the scale below, indicate the pitch of your tinnitus if it is tone-like. It might be helpful to imagine the scale as if it were a piano keyboard.

1	2	3	4	5	6	7	8	9	10
low pitch				middle pitch			high pitch		

24. Check any items below which describe how your tinnitus sounds:
    a. hissing
    b. cricket-like
    c. pounding
    d. pulsating
    e. whistle
    f. electricity in high tension wires
    g. radio between stations
    h. ringing
    i. steam whistle
    j. bells
    k. clanging
    l. ocean roaring
    m. ringing telephone
    n. tone

25. My tinnitus appears worse:
    a. after hunting/shooting
    b. after listening to loud music
    c. when I am tired
    d. when I am tense and nervous
    e. when I am relaxed
    f. after use of alcohol
    g. after use of any medicine, prescription or non-prescription
    h. at night before bed
    i. in the morning just after waking
    j. when using ear plugs
    k. other _____

26. My tinnitus causes me to take longer to get to sleep. Yes ___ No ___

27. My tinnitus prevents me from getting to sleep. Yes ___ No ___
    If yes, how often? ___ nights per week.

28. Check any of the following items which give you some relief from your tinnitus.
    a. listening to radio or television
    b. traffic sounds
    c. sounds of running water (e.g. shower, water in sink)
    d. medication (type: _____)
    e. changes in altitude
    f. radio static between FM stations
    g. other _____

29. My tinnitus is better:
    a. when I am tired
    b. when I am tense and nervous
    c. when I am relaxed
    d. after use of alcohol
    e. when I am in a noisy background
    f. when I run water in the sink
    g. other _____

30. Please complete this sentence.
    I would like help for my tinnitus because _____