

Management of the Tinnitus Patient

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The majority of tinnitus sufferers can be managed via explanation and reassurance after significant medical conditions are ruled out. However, there are a significant number of patients with tinnitus severe enough to interfere with daily life. These patients require an in-depth assessment, followed by practical suggestions on how to manage their tinnitus. Audiologists should become comfortable with available management approaches. An approach to tinnitus evaluation and relief procedures will be described.

Tinnitus is the subjective perception of sound by an individual in the ear or head unrelated to an external sound source. The National Institute on Deafness and Other Communication Disorders (NIDCD) estimates that 15% of the American population experience frequent or constant tinnitus, and 10% of this group suffer from a form severe enough to interfere with daily activity (Snow, 1991).

After significant medical abnormalities have been eliminated and/or ruled out, most patients find their tinnitus tolerable and require no further intervention. Those that continue to be bothered can benefit from further evaluation including education, a tinnitus diary, tinnitus quantification, and tinnitus measurements. Relief methods such as hearing aids, tinnitus maskers, and tinnitus instruments have important roles in treatment. The purpose of this article is to describe a comprehensive approach to management of the tinnitus patient.

MEDICAL AND AUDIOLOGICAL EVALUATION

A thorough otologic and audiometric evaluation of the tinnitus patient is important to identify serious and/or treatable causes. The characteristics of the tinnitus should be determined, for example, pitch, amplitude, continuity, and length of the symptoms. The examiner should identify whether the tinnitus is unilateral or bilateral, pulsatile or non-pulsatile, and objective or subjective.

Pulsatile tinnitus varies with the heartbeat. Objective tinnitus is audible to the examiner; subjective tinnitus is only perceived by the patient.

Aural complaints such as hearing loss, fullness, or otorrhea may aid diagnosis. Aggravating and alleviating factors should be elicited. In general, tinnitus is aggravated by stress, fatigue, and stimulants (such as caffeine) and is relieved by relaxation and background noise.

Tinnitus can be associated with systemic disorders such as hypertension and hyperthyroidism. A variety of neurologic disorders can affect the peripheral or central auditory system resulting in tinnitus. A list of the patient's medications is important. Although aspirin is the most common medication to be associated with tinnitus, there are a variety of others (Brummet, 1989).

An otologic, head and neck, as well as a focused neurologic and general examination, are required. Auscultation of the head and neck will determine if the symptoms are objective.

Patients presenting with tinnitus undergo a history and physical examination, and basic audiometric evaluation including pure tone thresholds, speech reception thresholds, word recognition scores, tympanometry, and acoustic reflex testing. Results of these evaluations determine whether further testing is necessary. In general, patients with asymmetric symptoms undergo auditory brainstem response testing. Patients with unilateral pulsatile tinnitus will usually undergo a CAT scan or an angiogram. Suspicion of a central nervous system abnormality or a retrocochlear pathology can be evaluated with an MRI scan.

QUANTIFYING TINNITUS

Prior to the tinnitus evaluation, a questionnaire is administered to quantify the nature of the individual's tinnitus and his/her reaction to it. Questionnaires measure the patient's perceived degree of handicap due to tinnitus, and responses can help the clinician direct priorities for tinnitus management. Questionnaire responses reflect the subjective reaction of patients and can be readministered during the management process to assess therapeutic progress. Two questionnaires, including the Tinnitus Severity Scale and the Tinnitus Handicap questionnaire are particularly useful.

The Tinnitus Severity Scale (TSS), developed by Sweetow and Levy (1990), covers five categories: (a) intrusiveness, (b) distress, (c) hearing loss, (d) sleep disturbance, and (e) use of medication. The scale consists of 15 multiple choice questions, requiring patients to circle the statement which best describes how they felt for the past week. Each statement is graded and then weighted. The score is divided by category to assist in analyzing the patients' responses, and the overall TSS score is reported. In our clinic, we utilize the TSS most frequently because the patient's response is a forced choice, and the scale includes items related specifically to sleep disturbance, often an issue for tinnitus patients.

Kuk, Tyler, Russel, and Jordan (1990) developed the Tinnitus Handicap Questionnaire. The questionnaire requires the patient to write a number between "0" and "100" to represent degree of agreement with each statement. Results are

reported as a percentage score. The total score may be used to quantify a patient's condition as a function of time or treatment. In general, the larger the score, the more severe the handicap. The 27-item questionnaire was completed by 275 clinic patients who reported tinnitus during their audiologic evaluation. A factor analysis suggested three separate areas or factors contributing to the questionnaire score: (a) physical, emotional, and social consequences of tinnitus; (b) hearing ability; and (c) patient's view of tinnitus. Patient response may be analyzed by comparing the patient's mean total score or each subscale score with normative group data reported for the 275 tinnitus patients.

TINNITUS EVALUATION

The aim of the Tinnitus Evaluation is to design a management program to maintain the tinnitus at an acceptable level and to identify effective relief procedures. The patient's participation and feedback are paramount during the evaluation. When beginning the evaluation it is important for the audiologist to emphasize to the patient the benign nature of the symptoms without minimizing the seriousness and intrusiveness of the complaint. The audiologist acts as a facilitator to explore the history and nature of the tinnitus, to assist in uncovering cause and effect relationships, and to determine management alternatives. What follows is a tinnitus evaluation procedure used in our facility.

History

Using the Oregon Clinic Tinnitus Survey (Vernon, 1987, 1990) as a guide, a thorough medical and social history is obtained (see Appendix). This lengthy history ensures that no factor in an individual's history is overlooked, reassuring the patient that every aspect of the case will be examined. Issues that were not mentioned to the physician are frequently revealed.

The tinnitus description and history section covers tinnitus onset, localization, description, severity, and level of annoyance. Attention is given to possible causative factors as well as to the patient's perception of disruption in life activities such as sleep, work, leisure, and relationships.

The medical and health information section provides a detailed medical history including medication use, illness, injury, surgery, and history of otologic and dental problems. Because patients often neglect to include all medications in their report to the physician, we review an extensive list of medications known to cause tinnitus. The hearing history and noise exposure section covers perceived hearing abilities and history of noise exposure in work, leisure, and military activities.

Tinnitus Diary and General Education

Frequently we ask patients to keep a tinnitus diary developed by the American Tinnitus Association (see Appendix). Keeping a diary assists patients in observing their tinnitus as they conduct their daily activities. The diary is reviewed at follow-up appointments to explore any aggravating or alleviating factors. Find-

ing cause and effect conditions promotes the patient's sense of control and allows an individual to take constructive action.

General guidelines are given to all tinnitus patients (see Table 1). Counseling is augmented by educational literature which provides general information and emotional and psychosocial support. Pamphlets are obtained primarily from ATA (see Appendix). We also have a lending library containing ATA journals, books, masking tapes, and a series of relaxation tapes. In addition, we keep a ring binder of ATA journals in our waiting room.

Table 1
General Guidelines Given to All Tinnitus Patients

<ul style="list-style-type: none"> • Avoid all loud sounds (any alterations in tinnitus are nature's way of warning you; heed these warnings – attenuation plugs may be recommended). • Avoid coffee and other sources of caffeine for one month to determine if tinnitus is reduced. • Maintain an active lifestyle. • Use alcohol in moderation. • Stop smoking. • Notify all physicians of hearing loss and/or tinnitus so they consider side effects before prescribing medications. • Join American Tinnitus Association (ATA).^a (People who have tinnitus are the best source of information and support about the condition.)
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^aA membership brochure and application are provided.

Tinnitus Measurements

In more difficult cases it may be desirable to acquire quantitative measurements of the patient's tinnitus including loudness matching, pitch matching, minimum masking level, and a measure of residual inhibition. The results of these measures can be useful for documentation, for counseling the patient and family, and to facilitate communication between the clinician and patient. Our procedures are similar to those outlined by Vernon and Meikle (1988).

Loudness matching. To match loudness, the intensity of the comparison tone at each frequency is increased from below threshold in 2 dB steps until threshold is reached. Then the intensity is increased in 1 dB steps until its loudness is judged equal to the loudness of the tinnitus. Using an ascending series and starting below threshold avoids the possibility of producing residual inhibition. It is important to perform several replications of the measurement. Most tinnitus is matched at surprisingly low levels at or below 6 dB SL (Meikle & Walsh, 1984). We have found measures of loudness in dB sensation level to be an easy and rapid method to employ clinically.

Pitch matching. Perceptions of sound experienced by tinnitus patients usually

have identifiable pitch. We employ the two-alternative forced choice method described by Vernon and Meikle (1988). The loudness level of the tones has been balanced to the tinnitus loudness in the previous procedure. Now the patient judges which is most like his/her tinnitus. Intervals 1,000 Hz apart are used for the comparisons. The contralateral ear to the tinnitus is generally used for comparison; if the tinnitus is bilateral, we present to the ear with lower amplitude tinnitus.

Repeat measures are obtained, and octave confusion is tested. Individuals with octave confusion identify the pitch match of the tinnitus, but with further testing, the real pitch match is either one octave above or below the original pitch match.

Maskability. To assess maskability, a low level band of white noise is presented to the tinnitus ear, and the intensity level is adjusted upwards in 2 dB HL steps until the patient reports no longer being able to distinguish the tinnitus from the masking noise in the stimulated ear. The lowest level in dB SL at which tinnitus first becomes indistinguishable from the noise is recorded as the minimum effective masking level.

Vernon and Meikle (1988) relate these findings to the acceptance of traditional ear level maskers. If the Minimum Masking Level (MML) is 0-3 dB SL, it is likely ear level maskers will work. If the MML is 4-10 dB SL, ear level masking may not be acceptable because the level of the masker may need to be adjusted too high to cover the tinnitus. If the MML is greater than 10 dB SL, the masker level would be intrusive, and it is doubtful masking would be tolerated. However, compensating for the hearing loss first may lower the level of required masking, and newer tunable maskers may circumvent problems observed with acceptance of traditional maskers. MML should not exclude a patient from being exposed to masking as an alternative form of management or from a trial with masking.

Residual inhibition. Tinnitus may be absent or temporarily reduced after a masking sound is discontinued. To measure residual inhibition, a white noise (or whatever stimulus was effective when assessing maskability) is presented to the ear with tinnitus for 60 sec, 10 dB above the recorded MML. When the masking sound is turned off, the patient is asked to describe the tinnitus loudness in the stimulated ear and to describe the magnitude of suppression. The patient is also asked to indicate when the tinnitus is first audible and when the tinnitus returns to its normal baseline level. Although residual inhibition may be complete or partial, its presence or absence does not indicate the appropriateness of masking as a relief procedure (Vernon, 1990; Vernon & Meikle, 1988).

Relief Procedures Through Masking

Masking is the obliteration of tinnitus by an external sound. Relief procedures through masking are presented and demonstrated to the patient and then evaluated through trial and error. According to Vernon (1990), masking relieves tinnitus if it gives the patient a sense of control over the tinnitus, is aesthetically more

acceptable than the objectionable tone/head noise, and if the external sounds provided by the masker can be easily ignored. Tinnitus patients must understand that, although masking is not a cure, the relief afforded by masking can be dramatic. Alternatives include ear level and tabletop tinnitus maskers, custom-made maskers, hearing aids as maskers, and tinnitus instruments.

Tinnitus maskers, in general, are sound generators which produce a wide band of noise or a tunable, narrow band of noise used to cover up the tinnitus. Presumably patients are more capable of suppressing an external noise than an internally generated noise. In general, devices have a user controlled masker level adjustment. The patient is instructed to use the lowest level of masking that will effectively cover up the tinnitus.

Our facility provides a 30-day trial period and encourages use of our loaner devices. We present and demonstrate masking as a relief procedure to all patients. Patients benefit in knowing such alternatives exist and in the counseling received from these sessions.

Following are device descriptions. Specification sheets and product brochures are available from several sources (see Appendix). Our intent is to share information about devices with which we have had experience, not to endorse a particular manufacturer.

Ear level maskers. Several ear level maskers (available as in-the-ear, canal, and behind-the-ear models) are manufactured by Starkey. At the time of this writing, available options include:

- the TM1, a custom ITE instrument most often used for those with no hearing impairment. It comes with a masker level volume control and an optional frequency response potentiometer to modify the frequency spectrum of the noise.
- the TM3, a behind-the-ear device with a masker, two dispenser adjustable potentiometers for frequency shaping, and a user adjustable three-position switch for adjusting emphasis of the noise spectrum and a masker level control. For a response which extends to about 10,000 Hz, the TM5 is recommended. Custom earmolds may be used to further modify the response, as in hearing aid acoustics.

More recently, Starkey has introduced the TM, a new tunable masker (Agnew & Johnson, 1993) which allows changes in the masking signal by either the clinician or the patient. The device comes with a masking level control and a potentiometer to shift the center noise frequency from 3000 to 12,000 Hz. The tunable masker comes in both an in-the-ear and a soft canal model recommended for maximum comfort if used as a sleep aid. The TM is also available from Omni Instruments.

Table top or bedside maskers. The Marpac sound conditioning products produce a sound or a variety of sounds which blend with or cover existing sounds in the room or head in order to enhance concentration or sleep. It is intended that the generated sound will become a part of the person's "normal" background

and that it will be forgotten while effectively masking the tinnitus. There are three different products:

The Sound Screen and Sleep Mate are electromechanical single or double speed sound conditioners that produce a smooth sound of rushing air. Those who find the sound of a fan an effective masker, but the cooling action of a fan undesirable, appreciate the sound screen.

The Marsona TSC-300 is an electronic sound conditioner that modifies white noise to a wide range of environmental sounds within rain and waterfall settings. The Marsona 1250 utilizes both digitized and synthesized sounds to generate a variety of sounds. There are seven sounds to choose from as well as digitally recorded sounds to overlap these base sounds.

More recently Microtek Medical developed another table top or bedside device. The Microtek 321Q tinnitus masker was developed by a design engineer who suffers from tinnitus. The unique feature of this device is the ability to select the center frequency of the masking noise bandwidth over the patient's tinnitus. The device then generates the minimum acoustic energy needed to just cover the patient's tinnitus in terms of frequency and intensity. The device has a wide range of narrow band responses from 500 to 16,000 Hz, and can generate noise bands of three discrete bandwidths: $\frac{1}{3}$, $\frac{1}{2}$, and 1 octave. The output has been limited to 85 dB SPL at a distance of 1 ft. Microtek provides a recommended fitting protocol to determine the minimum masking level.

Custom-made maskers. For some patients, commercially available devices are not effective or acceptable. For these individuals, the constant sound of a fan or air conditioner, or white noise from an FM radio tuned between stations may be alternatives. Other examples of customized maskers include tape recordings of a shower or faucet running, of the wind while riding on a bike, or of a rainstorm. Suggestions for custom-made maskers generally are derived from history information which addresses those occasions when the patient is least aware of the tinnitus. For those who use masking tapes or sound generators for sleep aids, we may recommend the use of a pillow speaker (see Appendix) to avoid disrupting others in the room. Personal monaural or binaural headphones may also be used.

Hearing aids as maskers. Amplification may be appropriate for relief of tinnitus in the presence of hearing loss whether the patient perceives hearing loss or not (Tyler & Bentler, 1987). Saltzman and Ersner (1947) were the first to recommend the use of hearing aids for tinnitus relief. Ambient environmental sounds are amplified by the hearing aid and mask tinnitus. In the literature there is comment that hearing aids are recommended for those with low frequency tinnitus (Goldstein & Shulman, 1991; Vernon, 1988). However, we have found hearing aids may be of benefit regardless of tinnitus frequency. Although a patient's primary complaint may be tinnitus, in the majority of cases tinnitus is accompanied by some degree of hearing loss and its associated communication difficulties. Correcting the hearing loss and thereby relieving the stress of communication is often a successful management alternative. Although the tinnitus

may not be completely masked, the patient may experience a reduction of loudness, annoyance, and discomfort of tinnitus.

Tinnitus instrument. The tinnitus instrument is a combination unit, including a tinnitus masker and a hearing aid, built into a single case. Any hearing loss should be corrected first so that excessive levels of masking are not required. The instrument has two independent volume controls; the hearing aid is set first, the masking sound second.

Starkey has the MA3 behind-the-ear tinnitus instrument with two independent volume controls, one for the hearing aid and one for the masker; and a three-position slide switch for high, low, or normal emphasis noise spectrum. There are also two dispenser adjustable potentiometers for further modification of the frequency response. Starkey's TM (tunable ITE masker) may also be combined into two hearing aid variations, the TML or TMC (linear or input compression) for those individuals with a hearing loss (Agnew & Johnson, 1993). These instruments are available with a variety of hearing aid gains and frequency responses.

SCREENING FOR REFERRAL

There are individuals who continue to suffer from tinnitus and find no relief from the management alternatives presented. With these patients, we administer one of two questionnaires to document the need for referral.

The Tinnitus Reaction Questionnaire (TRQ) was developed by Wilson, Henry, Bowen, and Haralambous (1991) to assess the psychological distress associated with tinnitus and to evaluate the effects of psychological interventions. The TRQ is a 26-item questionnaire. Items were drawn from symptom categories described by Tyler and Baker (1983) and from experience of the authors. The patient is asked to respond by circling the number that best reflects the effects of tinnitus over the past week.

Construct validity was assessed by testing subsets of patients on several psychological tests which revealed moderate-to-high correlations with measures of depression and anxiety. Wilson et al. (1991) felt such a test may be useful for distinguishing tinnitus sufferers who cope with the problem from those who do not. Prior to the use of this scale, personnel in our office used and will at times continue to use, the Beck's Depression Inventory (Beck, Ward, Mendelson, Mock, & Erbaugh, 1961). The psychologists and psychiatrists with whom we work have recommended these scales to document the need for referral without labeling the patient. The scales are readministered following interventions to measure treatment outcomes.

CASE STUDIES

A.G.

A.G., a 62-year-old male, presented to our group in July, 1992 with a 3-year history of buzzing tinnitus that was more pronounced in the right ear. The

symptoms disrupted his lifestyle and increased with stress. He also complained of neck pain. A.G. was unaware of hearing loss but had a history of noise exposure. He had been under psychiatric care for anxiety and tinnitus. Previous MRI scan and allergy evaluation were both normal. His head and neck exam and otoneurologic exam were unremarkable.

Audiometric testing revealed a moderate, high frequency sensorineural hearing loss bilaterally, greater for his right ear than his left, with excellent word recognition bilaterally. Tympanograms and acoustic reflexes were normal. ABR and basic bloodwork were found to be normal. It was concluded that the tinnitus was secondary to the hearing loss but because the symptoms continued to be bothersome, tinnitus evaluation was recommended.

A.G. declined completing a Tinnitus Questionnaire. A.G. assigned a "ring rate," defined as the percentage of time the tinnitus is present at troublesome levels. While on vacation he experienced relief with a "ring rate" of 25-30%. When he returned to work he experienced a "ring rate" of 80-85% for over 2 weeks.

His tinnitus was unrelated to diet, medication, jaw movements, or alterations in body position. Reportedly, his psychiatrist noted stress and fatigue correlated directly with his tinnitus exacerbations. A.G. effectively used a fan and an FM radio tuned between stations to assist him in falling asleep. Although he denied a hearing loss, he did admit to communication problems in group situations, noisy environments, in the back seat of a car, and at movies. A.G. felt his tinnitus interfered with his ability to hear well in these situations. He was exposed to noise periodically when he was required to enter the plant but did not use any ear protection.

A tinnitus diary was provided so A.G. could formally document the exacerbations of his tinnitus to determine any causative factors. A discussion of noise and its effects on hearing and tinnitus ensued. Preventive measures were recommended. An ATA pamphlet regarding noise and its effects on hearing and tinnitus was provided. A.G. declined custom ear protection, but agreed to try EAR plugs. Tinnitus maskers were demonstrated, but he declined a trial.

A discussion revealed that stressful situations increased his tinnitus and were generally work related, often involving meetings. Hearing loss and associated communication difficulties were discussed. A trial with a high frequency emphasis hearing instrument for his right ear was recommended. He borrowed several items from our lending library. A.G. commented he felt very optimistic after our evaluation and was pleased we had not simply dismissed him with the comment, "learn to live with it."

Two weeks later A.G. returned for follow-up and hearing aid fitting. Review of his diary revealed most exacerbations were associated with difficult communication situations or the pending fear of one. He noted no other causative factors. In addition, he began the use of EAR plugs and/or earmuffs for the plant.

A.G. returned 2 weeks later and reported improvement. His "ring rate" was 25-30% the entire 2 weeks, and he was comfortable wearing the hearing aid all

waking hours. He noted communication benefit and a decrease in tinnitus and neck pain. Seven months later he returned for a hearing aid check and reported, "I am having no trouble. The tinnitus is the lowest it has ever been with a ring rate of 5-10%. This tinnitus is livable."

S.Z.

S.Z., a 44-year-old female, was seen in October, 1992 with a chief complaint of tinnitus present since childhood which had increased noticeably in the last 2 years. The bilateral tinnitus was described as a continuous locust sound more noticeable in the left ear. Both of the patient's parents had hearing loss of unknown etiology. Her mother used amplification successfully. S.Z. reported no significant medical or health problems. Head and neck and otoneurologic examination were within normal limits.

Results of an audiometric evaluation revealed hearing sensitivity within normal limits in the right ear with excellent word recognition. The left ear had a mild, low frequency conductive hearing loss with excellent word recognition. Tympanograms were within normal limits bilaterally. Acoustic reflexes were consistent with left peripheral involvement.

At this time, S.Z. was counseled regarding audiometric findings and early otosclerosis as the probable cause of her hearing loss and tinnitus. Regular follow-up was recommended. She continued to be disturbed by the tinnitus and was referred for tinnitus evaluation.

Results of the Tinnitus Severity Scale (see Table 2) revealed high scores for the categories of sleep disturbance, intrusiveness, and distress concerning the possible progression of her tinnitus.

Table 2
Tinnitus Severity Scale for S.Z.

Category	Initial Score	Follow-up Score	Possible Range of Scores ^a
Intrusiveness	28	18	16-64
Distress	35	35	10-40
Hearing loss	11	9	7-28
Medication	N/A	N/A	3-12
Sleep disturbance	9	3	3-12
Overall	81	60	39-156

Note. Category scores initially revealed Intrusiveness, Distress, and Sleep disturbance as problem areas. Follow-up revealed reduced scores for Intrusiveness and Sleep disturbance, suggesting benefit from the management plan.

^aThe magnitude of each range reflects the relative importance of each category, that is, Intrusive is more significant than Medication (Sweetow & Levy, 1990).

The tinnitus fluctuated depending on activities and her listening environment. S.Z. found it difficult to be in quiet and played the TV or radio for relief. However, family members found the volume objectionable because she was often listening from another room. The tinnitus caused difficulty falling asleep without the use of a fan or music, which her husband found objectionable. Once S.Z. was asleep, she had no trouble staying asleep. She wore EAR plugs for loud leisure activities since loud noises aggravated her tinnitus.

S.Z. reported feeling "frazzled" and noted increased difficulty coping because family members became agitated with her methods of tinnitus management. Previous medical consults were unhelpful. Her sister, a psychologist, exposed her to a "masking machine" which was not beneficial. Tinnitus measurement procedures were difficult for the patient and were discontinued at her request. Various tinnitus masking alternatives were demonstrated.

The Marpac sound screen 950 (dual speed) was demonstrated. S.Z. found the sound very soothing and was eager to have the opportunity to try the device at home. Unlike the fan, it would not cool off the room, which was her husband's objection to the fan. A pillow speaker (see Appendix) was loaned for trial. A TV band radio (see Appendix) was recommended to bring the sound source into the same room, affording lower listening levels. Information from the American Tinnitus Association and the Tinnitus Family Information brochure was provided as well as general warnings provided to all tinnitus patients.

S.Z. agreed to keep a tinnitus diary and returned 2 weeks later for follow-up at which time she reported the Marpac masker was soothing and her family was more accepting of it. The pillow speaker was also a positive experience. S.Z. and her family appreciated the benefits of the TV band radio as well. Purchasing information was provided.

Re-administering the TTS (see Table 2) revealed lower scores overall. S.Z. readily fell asleep with the masker. The tinnitus was less intrusive, but S.Z. continued to fear the tinnitus would eventually worsen. This concern was addressed by her physician and audiologist.

Follow-up 2 and 6 months after the original evaluation revealed S.Z. was managing well. The Marpac masker and the TV band radio continued to be effective and acceptable maskers. She had no trouble falling asleep. She also used the masker during quiet times of the day to help her concentrate. S.Z. will be regularly followed regarding her tinnitus and otosclerosis.

A.C.

A.C., a 46-year-old male, presented to our clinic in October, 1992 with a relatively sudden onset of bilateral tinnitus 4 months prior. Initially his tinnitus was intermittent but progressed to continuous. A.C. described it as a hissing sound alternating with a high pitched steady tone that disrupted his sleep and concentration.

Upon examination he had treatable otitis externa. The remainder of the exam was unremarkable. He was counseled about tinnitus and available management options.

Follow-up 2 weeks later revealed the otitis externa had resolved. Audiometric testing revealed pure-tone thresholds, word recognition scores, tympanograms, and reflexes were within normal limits bilaterally. A.C. responded "almost all the time" to all items on the Tinnitus Reaction Questionnaire, suggesting he was not coping well with his tinnitus. Consultation with the physician resulted in an immediate referral to a psychiatrist.

Following several months of biofeedback and counseling, A.C. returned to our practice. Although he was more accepting of the problem, he continued to be disturbed during quiet periods and a tinnitus evaluation was recommended.

Tinnitus measurements revealed a match at 4000 Hz presented at 6 dB SL, a minimum effective masking level of 7 dB HL, with no residual inhibition. Masking alternatives were demonstrated. A diary was provided, the "Coping with Tinnitus" tapes were loaned, and the Microtek 321Q tinnitus masker was dispensed for trial use.

A follow-up interview revealed that anticipation of stressful situations aggravated A.C.'s tinnitus during the evening hours. He observed his awareness changed, rather than the absolute loudness of his tinnitus. The Microtek 321Q tinnitus masker was useful during quiet activity such as reading, and he had made several masking tapes.

The diary reportedly was helpful in his therapy sessions with the psychiatrist, and A.C. requested another diary. Massage therapy was added to his management plan as a stress reducer.

SUMMARY

There is no single method of management for patients with tinnitus. Many experience stress with the noise but when their condition has been determined not to be serious, the tinnitus becomes accepted as a minor disturbance which can often be ignored. Other tinnitus patients do not accept the thorough assessment and explanation of the benign nature of their complaint. These patients need continued support from their physician and audiologist. The audiologist must acknowledge the problem and the patient's concern while reiterating that the medical and audiometric evaluations have indicated no serious medical condition. Professionals must provide patients with education regarding their problem. An extensive exploration of the tinnitus and the patient's history are beneficial to guide counseling regarding cause and management alternatives. Trial and error continues to be necessary to identify the most effective management or combination of management alternatives. Some patients may continue to focus on their tinnitus, finding no relief from the education and management alternatives presented. Audiologists should learn to identify those in need of referral for psychological evaluation. Although tinnitus management can be lengthy and requires a flexible approach, we have found that patients benefit from and appreciate the effort to seek suitable relief procedures.

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APPENDIX

SOURCES OF MATERIALS AND INSTRUMENTS

Oregon Clinic Tinnitus Survey. Available by contacting Jack Vernon, PhD, Professor of Otolaryngology, Director, Oregon Hearing Research Center, Oregon Health Sciences University, 3515 S.W. Veterans Hospital Road, Portland, Oregon, 97201-2997, (503) 494-7954.

The Tinnitus Diary. Available by contacting Gloria E. Reich, PhD, of the American Tinnitus Association, P.O. Box 5, Portland, Oregon, 97207, (503) 248-9985.

Publications List of brochures, books, tapes, videos, quarterly journal available from American Tinnitus Association, P.O. Box 5, Portland, Oregon, 97207, (503) 248-9985.

Tinnitus Masker and Tinnitus Instrument Product information available from Harlan D. Conkey, Managing Director, Starkey Northwest, 2255 Northeast 194th Avenue, Portland, Oregon, 97230, (503) 661-7424.

Pillow Speaker available from Radio Shack catalog number 33-206 or 33-208 or from Hal Hen catalog number 2428.

Marpac Corporation, P.O. Box 3098, 2907 Blue Clay Road, Wilmington, North Carolina, 28406, (919) 763-7861.

Microtek 321Q Tinnitus Masker available from 3M Hearing Health Laboratory 3M Center, Building 200-6A-18, St. Paul, Minnesota, 55144-1000. Contact Paul Stypulkowski, PhD, (612) 733-6997 or (800) 253-2163.

TV Band Radio available from Radio Shack catalog number 12648 or 12614.

Note. The above does not represent a complete list of materials nor is it an endorsement for any particular manufacturer.