

6

Sound Tolerance Evaluation and Management (STEM)



As described in the previous chapter, the Tinnitus and Hearing Survey (Appendix D) includes two items in Section C that screen for reduced sound tolerance. The first item determines if a patient perceives that he or she has a loudness tolerance problem, and, if so, how much of a problem. If a problem is reported, then the second item is used to determine if the patient would experience difficulty attending the Level 3 workshops due to the sound/loudness tolerance problem. If the patient reports a sound tolerance problem, but can attend the workshops to address a tinnitus problem, then the patient normally should attend the group sessions. Some patients, however, may express a strong desire to focus on their sound tolerance problem rather than the tinnitus, and those wishes should be honored even if the patient is capable of participating in the Level 3 workshops.

During the Level 3 workshops, patients learn how to use therapeutic sound in various ways for managing reactions to tinnitus. All of the suggestions for using sound to manage tinnitus also are relevant for managing a sound tolerance problem. That is, if the patient follows the suggestions for using therapeutic sound, then not only can the

sound help with the tinnitus, but it also can help to increase tolerance to sound (Formby, Sherlock, & Gold, 2002). If the patient indicates on the second item of Section C that he or she would not be comfortable attending Level 3 Group Education, then that should alert the clinician to discuss sound tolerance with the patient and consider scheduling a special appointment to evaluate the sound tolerance problem. As mentioned above, some patients may just wish to focus on their sound tolerance problem.

What Is STEM?

The sound tolerance evaluation and management (STEM) protocol is an adjunct program primarily for patients who have a sound tolerance problem that precludes them from participating in the PTM protocol. These patients are identified at the Level 2 Audiologic Evaluation as requiring the special STEM program (see Chapter 5). Their progress through PTM is suspended temporarily until they complete the STEM program. Sound-based intervention that

patients receive through the STEM program also may resolve their tinnitus problem, in which case they may not need to resume the PTM program (see PTM Flowchart—Appendix A). As a general rule, however, any patients with problems specific to tinnitus should be advised to participate in Level 3 Group Education.

The STEM evaluation appointment can include three components: administering the Sound Tolerance Interview (STI), testing loudness discomfort levels (LDLs), and trial use of ear-level instruments. Only the STI is essential for the evaluation, that is, it is essential to conduct an in-depth interview to fully understand the nature and severity of the problem, and to develop an appropriate management plan. The STI also provides data that can be used as a baseline to evaluate progress over time.

All patients who participate in STEM should receive counseling for reduced sound tolerance. A counseling protocol is provided in the patient counseling book (*Progressive Tinnitus Management: Counseling Guide*) (J. A. Henry et al., 2010b).

Sound Tolerance Interview

The six-question Sound Tolerance Interview (STI) (Appendix K) fits within the framework of PTM and serves to guide the STEM evaluation procedures. The interview starts with a series of questions (embedded in Question 1) to determine if the use of hearing aids contributes to the patient's reported sound tolerance problem. Questions 2 through 5 are used to obtain details concerning the kinds of sounds and activities that are problematic, and the degree of the problem in each case. Question 6 is intended to determine if the patient overprotects his or her ears through the use of hearing protection. (Overuse of hearing protection can sustain or exacerbate a sound tolerance problem.)

Treatment for Reduced Sound Tolerance

As explained in the patient handout "What to Do When Everyday Sounds Are Too Loud" (Appen-

dix E), the essence of treatment for a sound tolerance problem is the systematic use of sound to decrease sensitivity to sound. Although there are different manifestations of a sound tolerance problem (as described in Chapter 1), a generic approach to treatment usually is adequate. The treatment involves increasing ambient levels of sound (with the possible use of ear-level instruments) as well as increasing activities involving active listening to sounds that the patient finds enjoyable. This combined approach thus includes: (a) passive listening procedures, which address general hypersensitivity to sound, and (b) active listening procedures, which address the emotional components of a sound tolerance problem. Procedures for addressing these different components individually are available using the method of tinnitus retraining therapy (TRT) (J. A. Henry, Trune, Robb, & P. J. Jastreboff, 2007a, 2007b; P. J. Jastreboff & Hazell, 2004). These TRT procedures can be used if the clinician has familiarity with the procedures.

Counseling for reduced sound tolerance is provided in a structured format using the patient counseling book (*Progressive Tinnitus Management: Counseling Guide*) (J. A. Henry et al., 2010b), which contains a special section for this purpose. The counseling book functions like a flip chart to facilitate the one-on-one counseling. The content of the counseling corresponds closely with the patient handout "What to Do When Everyday Sounds Are Too Loud" (Appendix E). The handout normally is provided to patients at the Level 2 Audiologic Evaluation if they report any degree of a sound tolerance problem. The counseling leads to an explanation of the Sound Tolerance Worksheet (Appendix L). Patients learn how to complete this special worksheet to develop customized plans for self-managing their sound tolerance problem using therapeutic sound.

Testing Loudness Discomfort Levels (optional procedure)

Testing loudness discomfort levels (LDLs) is less important than information obtained from the Sound Tolerance Interview. At the audiologist's discretion, LDLs can be tested for patients who go through the STEM

program, but LDL testing is not normally recommended. Although this is a debatable point, we consider LDL testing to be nonessential even when a patient has a severe problem with reduced sound tolerance because: (a) testing LDLs can cause discomfort and anxiety in patients; (b) the validity of LDLs as a measure of loudness tolerance in daily life has not been established; and (c) the results of LDL testing do not normally guide intervention procedures.

If a patient has reduced tolerance to sound, it is our position that the best indicator for establishing the degree of a sound tolerance problem, and to monitor progress during treatment, is the patient's subjective report—which is facilitated through administration of a structured interview with the STI (see Appendix K). Results of the interview define the problem and indicate the course of action that should be taken, regardless of the results of LDL testing. Some audiologists choose to do LDL testing, which is acceptable as long as the patient is comfortable with the procedures. LDL procedures are described further below.

Definition of LDL

The threshold level of discomfort for a sound defines that sound's LDL. The LDL should reflect the level just below physical discomfort and not just fear that the sound is going to become too loud (a common manifestation of phonophobia). Clinical LDL testing can be done using pure tones, speech stimuli, and narrow and broadband noise. Using pure tones, LDLs can be obtained at various audiometric frequencies, establishing the upper limit of the auditory dynamic range for each frequency tested. Sounds would be tolerated comfortably anywhere within the dynamic range.

Measuring Tonal LDLs

(Please refer to *Loudness Discomfort Levels—Clinical Guide*—Appendix M.) If tonal LDLs are tested, then they should be obtained minimally at octave frequencies between 1 and 8 kHz. LDL testing may be performed at additional frequencies and with other types of auditory stimuli. Patients often are

inconsistent when providing repeated LDLs within a test session. Some providers therefore measure each LDL twice. This is done by first obtaining the LDLs in each ear, then repeating the entire set of measurements.

Instructions to Patients

Loudness discomfort levels can vary considerably depending on the test instructions given to the patient, and on the patient's interpretation of the instructions. It is essential to read standardized scripted instructions verbatim and to ask patients to repeat back the task as they understand it. Patients are instructed, "You will listen to different tones. Each tone will be made slightly louder in steps. Tell me when the loudness of the tone would be ok for 3 seconds, but would not be OK for more than 3 seconds." The objective is to identify the level for each frequency at which any further increase would cause discomfort.

Audiometric Procedures

Testing in each ear should start at 1000 Hz, with successive frequencies ordered from lowest to highest. The first tone is presented at the approximate most comfortable level (usually 60 dB HL is appropriate to start). Each tone is presented for 1 to 2 seconds, and successive tones are raised in 5 dB steps until the LDL is reported. At each new frequency, the starting level should be about 20 dB below the previous frequency's LDL.

As LDL testing is probably the patient's least favorite procedure, it is important to perform the testing as rapidly as possible (without compromising the measures). If two sets of measures are obtained, only the second set should be reported. Reliability of responding also should be noted.

In-Clinic Trial Use of Ear-Level Instruments (optional procedure)

After the sound tolerance evaluation, which includes administering the STI (Appendix K) and possibly LDL testing (Appendix M), it then is decided if the patient should be evaluated for ear-level

instruments. This decision depends largely on the extent of the problem, which should be clear after the evaluation.

Although ear-level instruments might provide the optimal treatment for a sound tolerance problem, they may not be necessary. Often, sound enrichment using a variety of sound sources can provide an adequate acoustic-desensitization protocol. The clinician should weigh the pros and cons of ear-level instruments for each patient and decide, along with the patient, if these devices might be the best choice for treatment. If so, then in-clinic trial use of ear-level instruments should be performed. The in-clinic trial can be conducted either before or after the counseling, whichever is most appropriate for the patient.

When Are Ear-Level Instruments Indicated?

The decision to use ear-level instruments with a patient who has hyperacusis is based primarily on two factors: (a) the patient's sound tolerance condition must be reasonably severe to justify the use of these instruments; and (b) the patient must be motivated to use the instruments. If either of these factors does not apply, then the patient should be counseled appropriately to use sound desensitization procedures without the use of ear-level instruments.

Conducting the In-Clinic Trial

The purpose of the in-clinic trial is to provide patients with the experience of wearing and listening to sound-generating devices—to help them decide if using ear-level instruments is desirable. The sound should be described as a “soothing shower sound” and not in negative terms such as noise or static. It is possible that some patients will not be comfortable listening to the sound, but that even just wearing the instruments might be appropriate for the first phase of treatment (i.e., some patients need to just wear the instruments turned off for a period of time before they can start listening to the sound emitted from the instruments). Conducting the trial simply is a matter of fitting

each stock device to patients and allowing them to direct the process of adjusting the sound levels. This process might take more or less time depending on individual patient characteristics.

Definitions: Hyperacusis, Misophonia, Phonophobia, Loudness Recruitment

Definitions for these terms were provided in Chapter 1. They are reviewed briefly here. Hyperacusis is a physical condition of discomfort or pain caused by sound (J. A. Henry, Zaugg, et al., 2005a). The effect is restricted primarily to the auditory pathways.

Misophonia means literally “dislike of sound,” implying that emotions somehow are involved in the reaction to sound (M. M. Jastreboff & P. J. Jastreboff, 2002). Misophonic reactions would be learned responses, thus the same sound might be bothersome in some situations and not in others. Phonophobia is a subcategory of misophonia, and specifically is a fear response caused by sound (P. J. Jastreboff & M. M. Jastreboff, 2000).

Any or all of these conditions might apply to a patient who complains of loudness tolerance problems. None of these conditions should be confused with loudness recruitment, which is abnormally rapid growth in the perception of loudness (Vernon, 1976). Recruitment usually is a symptom of cochlear or sensorineural hearing loss.

For purposes of PTM, any condition of reduced sound tolerance (hyperacusis, misophonia, phonophobia) is referred to as hyperacusis. The STEM program does not make a distinction between these different conditions with respect to the counseling and sound desensitization procedures. The treatment procedures are designed to address both physical and emotional aspects of reduced sound tolerance.

Conclusion

We have conducted screenings and evaluations of thousands of patients with tinnitus in multiple clinics as part of our clinical studies. It has been

our experience that many of these patients report a sound tolerance problem, but that a very small number actually experience a severe problem warranting special evaluation and treatment procedures. If patients do have a severe hyperacusis problem (or if they just want treatment for reduced sound tolerance), then the STEM protocol should address their needs. The STEM protocol is implemented before the flow of PTM services continues, that is, these patients should be treated separately and then worked back into PTM as warranted by tinnitus-specific complaints.

With the STEM protocol, all patients with a severe sound tolerance problem are assumed to have some combination of hyperacusis and miso-

phonia. Very few patients have “pure” hyperacusis or “pure” misophonia (see Chapter 1), thus a combined approach usually is appropriate. For these patients, special consideration should be given to collaborating with mental health clinicians to address potential psychological components of the problem. Behavioral interventions have been shown to be highly effective in decreasing patients’ responses to intense fear. Such interventions have been well described in the CBT literature (Hofmann & Smits, 2008). Thus, psychological interventions such as CBT may be used to help patients systematically modify their fear responses, habituate to everyday sounds, and achieve a greater sense of well-being and control.

