

# Chapter 24

## Tinnitus

The day after my ear incident I was admitted to the hospital for tests, nausea control, and blood electrolyte corrections. At some time during the night, I began to “hear” an occasional strange noise in my deaf left ear. This was definitively not normal. At first it sounded like a very low-frequency, slurred murmur that reminded me of a B-grade movie villain’s voice. The following morning, however, it was a much more pronounced whir that was difficult to ignore. I would soon find out that there was a lot more to hearing loss than not hearing so well; hearing loss can be accompanied by a variety of other features.

As I stated earlier, when Dr. Todd came to visit me in the hospital, I reported “hearing” all sorts of odd sounds. He told me that, regrettably, I was developing subjective tinnitus as a consequence of my hearing loss. He had so hoped that I would be spared. He used the term “subjective” because I alone could “hear” the sounds. He informed me that these were “phantom” noises that came from the brain, not the ear. Some people perceive the sounds in the ears, while others perceive that they come more from inside the head and refer to them as “head noise.” Although tinnitus is frequently a *symptom* of other underlying conditions, in my case we knew what caused it—cochlear and possibly nerve damage.

Dr. Todd mentioned that many people with hearing loss report having tinnitus. This is when I learned that the appearance of ear noises is often the first sign—a *red flag*—that something is not right with our hearing. The doctor felt that my noises would change, as the sounds of tinnitus tend to match the frequencies of the hearing loss.

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Over the next few days, the garbled noises gave indeed way to more generic din that gradually became refined to a high-frequency hiss.

The doctor was cautiously optimistic that the noises might ease a bit as I regained more hearing, but I should not count on it. He said that unfortunately there was no cure for tinnitus but that various management approaches could make life easier. This was bad news. I could not imagine how I would ever live with tinnitus, my “ear phantom,” after it besieged my damaged ear within hours of my hearing loss.

Tinnitus is defined as the perception of sound in the absence of an outside noise source. It is commonly called “ringing in the ears.” The name itself is derived from the Latin verb *tinnire*, which means “to ring.” This is, however, a very limited description. It did not take long for me to learn that there was a lot more to tinnitus than mere ringing.

It was depressing to hear Dr. Todd say that there was no cure for the ear din. Many different causes are known to trigger this mysterious condition, yet it is unclear exactly how the noises are generated, why they are generated, and by what nervous pathways they travel. Until we know that, it will be difficult to devise a medication or some other treatment able to quiet the phantom. Scientists agree that the answers are within the brain, which is a simple but very loaded truth. We need more research and for that we need money, a lot of devoted scientists, and loads of sophisticated equipment. Although it is being studied worldwide, the phantom does not surrender its secrets easily.

### ***Tracking the Tinnitus Signal***

There are plenty of theories about the nature of tinnitus but none gives any definitive answers. Considering the variety of causes that can lead to tinnitus, it is unlikely that a single theory could explain it all. The suspected mechanisms are not mutually exclusive, and more than one of them might contribute to the ear noise in any given case.

A damaged cochlea has long been considered a leading cause of

tinnitus. If hearing cells are harmed, they send frequency impulses to the brain that are faulty, random, and weak. An injured cochlear nerve might similarly relay defective frequency information or stop transmitting signals altogether. In the process, the nicely organized frequency map of the auditory cortex is seriously disrupted. The attempt of the brain to tune into the frequencies that have weakened or fallen off the grid may ultimately result in tinnitus noise that matches the affected frequencies, which is certainly true in my case. Though cochlear damage might get the tinnitus ball rolling, it has been shown that once the noises take hold, they seem to feed on themselves. There are areas in the brain that actually change in response to long term tinnitus.

Scientists realized early on that cochlear issues were only part of the tinnitus puzzle. The search had to be expanded beyond the inner ear to include the intricacies of the auditory pathways, the brainstem, and the auditory cortex, or hearing portion of the brain.

Researchers have identified a sound-relay structure in the brain—the dorsal cochlear nucleus (DCN)—as a target for study. Over the years, suspicions have mounted that changes in DCN nervous activity contribute to the generation of tinnitus signals. It also has been found that the DCN has ties to other areas of the brain, notably to those that are involved with concentration and emotions. This is significant. Anyone who has tinnitus knows that especially negative emotions and paying too much attention to the noise can whip the phantom into action. It sounds reasonable that the DCN will be a focal point when scientists look for ways of treating tinnitus effectively. At this time, research centering on the DCN and its role in tinnitus is ongoing and very lively.

By using a variety of high-tech diagnostic machines, researchers also peek into the revved-up tinnitus brain to measure and record responses. Functional MRI scans (fMRI) have revealed important information on how tinnitus signals travel and which brain structures

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might play a part in the generation and maintenance of the tinnitus sounds.

In addition, scientists are working their way from identifiable anatomical details to the cellular levels. Special proteins, calcium channels, receptors, and brain substances are all put under the microscope in order to determine their contribution to the ear ruckus. Some scientists believe that the paths traveled by tinnitus signals, no matter what their cause, intersect at a common point. Locating such a convergence point could be of great importance when it comes to developing drugs capable of stopping the noises in their tracks.

Those who are interested in the more intricate scientific research details may find *Tinnitus Today*, a publication of the American Tinnitus Association (ATA), most interesting. Thanks to unrelenting research efforts, we know a lot more today than we did just a few years ago. New diagnostic technology has been of great assistance. Also, the ever-increasing number of tinnitus patients seeking help tells researchers that this is indeed a field that deserves their attention; millions of us are waiting. Maybe at some point in our lives, we will enjoy once again a bit of quiet, thanks to all of those who so tirelessly stalk the phantom on our behalf.

# Chapter 25

## Tinnitus Types and the Importance of a Medical Evaluation

Various types of tinnitus produce a variety of different noises. Our being able to describe our ear sounds accurately might lead the physician in the right direction when looking for a possible cause.



Although tinnitus is often called “ringing in the ears,” many describe different sounds. People with tinnitus often say that they hear ringing, buzzing, steam hissing or other sounds. *photos: R.Hammond*

### ***Subjective Tinnitus***

When Dr. Todd initiated me to the reality that the ear phantom had come to live with me, he called the noises “subjective tinnitus.” This is the most widespread type of tinnitus. One could call it the classic kind. Most cases are due to “sensorineural” hearing loss, which is often the result of damage due to excess noise. The American Tinnitus Association states that more than 90 percent of their members with tinnitus report some degree of hearing loss.

“Subjective” means that the noises can only be “heard” by the patient. Even with special instruments, the doctor cannot verify the