Tinnitus is the perception of sound where there are no other external sounds present. The enigmatic, persistent nature of tinnitus has baffled physicians for centuries and can have an unpredictable impact on a person’s quality of life. This article provides the readers with an overview of the condition and summarizes the various management techniques from the early ages to today.

Tinnitus is the presence of self-perceived sounds in the absence of any acoustic stimulus. It is self-perceived because tinnitus is only “heard” by the person suffering from it. The sound may be different between individuals in terms of the type of sound that is “heard,” its duration, and its loudness. Some examples of the types of sounds include buzzing, ringing, hissing, rumbling and sizzling. The perceived sounds may also vary in terms of duration, from occurring spontaneously to being present at all times, and can be influenced by a number of factors such as stress, annoyance levels, hearing loss, vertigo and hyperacusis (Hiller & Goebel, 2006; Henry & Meikle, 2000). At least 1 out of 10 adults in the United States may experience some form of tinnitus, with the condition being more prevalent in an older population (Bhatt, Lin, & Bhattacharyya, 2016; McCormack, Edmondson-Jones, Somerset, & Hall, 2016).

The condition can be bothersome because there is no “off” switch, and therefore the tinnitus sufferer has to endure the noise and/or find external methods of coping with its presence. Some examples of compensatory strategies include habituation or deconditioning to the sound or using other sounds to mask the percept. Although it is an enigmatic condition in that we still don’t fully understand what generates the percept, tinnitus itself is not an uncommon phenomenon. History has made note of specified “treatments” for “humming in the ears” that date back to ancient Egypt, and the condition continued to be a subject of discussion during the eras of philosophers such as Hippocrates and Aristotle (Stephens, 1984). An English translation of a statement made during this period highlighted an attempt at rationalizing the ability to mask tinnitus, “Why is it that the buzzing in the ears ceases if one makes a sound? Is it because a greater sound drives out the less?”

In his historical overview of tinnitus treatments during the Middle Ages, Stephens (1984) reported that physicians attempted to treat tinnitus according to the ailment that supposedly caused the conditions. For instance, physicians utilized treatments directed at fevers or the states of the humors, both of which related to the bodily temperament. Treatment consisted of various concoctions of oils, myrrh, vinegar, castor and juices from various plant and animal matter. There were also recorded observations of using external sounds to mask tinnitus. French surgeon Guy de Chauliac (1300–1370) reported that some of his patients with tinnitus were “comforted by walking in various places,” presumably meaning that the presence of other external sounds provided some comforting amount of masking.

At the turn of the 19th century, Jean Marc Gaspard Itard (1775–1838) recognized that multiple etiologies can be associated with tinnitus, and attempted to classify tinnitus into two main categories:
1. True tinnitus, which related to vascular conditions and hearing loss.

2. False tinnitus, which related to noise exposure, hysteria, stomach upsets or hallucinations.

It was also noted that some of his patients did not find relief from the various tinnitus treatments at the time, and as such his next steps aimed at helping to make the tinnitus percept more bearable by reducing sleep disturbances and ongoing worry. He also observed that covering or masking the internal noise with external sounds that were similar to what was heard was a highly successful technique at the time. For example, “whistling” sounds could be masked by the sound of burning damp wood and “bells” ringing could be masked by the sound of dripping water into a copper bowl.

Despite various methods used throughout the centuries to manage tinnitus, there are commonalities in the theme of the management strategies attempted:

1. Pharmacological
2. Reduction of ongoing stress and worry
3. Masking the tinnitus percept

In more recent times, a variety of pharmaceutical drugs have been tried to reduce or remove the percept of tinnitus, with varying amounts of success. Some pharmaceutical interventions using lidocaine, for example, were found to provide temporary relief from tinnitus that lasted from minutes to up to three days for a subset of people with the condition. However, there are also reports of a worsening percept of tinnitus with the use of lidocaine (Hartigh et al., 1993). Other anticonvulsant drugs were also similarly successful in providing minor, temporary relief (Goodey, 1981). Unfortunately, the management of tinnitus through the use of pharmaceutical drugs is generally unreliable and does not provide 100 percent relief. This is unsurprising because tinnitus is symptomatic, meaning that it could be triggered by a variety of conditions, such as hearing loss or other conditions that are not apparent to the physician. Until we have a solid understanding of the underlying physiological changes that generate or trigger the condition and, more importantly, evidence of the benefit of pharmaceuticals, the current clinical practice guideline panel strongly recommends against the use of most medication for the routine treatment of persistent, bothersome tinnitus (Tunkel, 2014).

The ability to classify tinnitus into subcategories is also important due to the symptomatic nature of the condition. Douek (1981) summarized various classification methods that were attempted in the past, which included the following:

1. Objective and subjective tinnitus, where objective tinnitus would be heard by an external observer. This could include tinnitus triggered by vascular or muscular spasms.
2. Site of lesion, where subclasses of categories were classified according to the place along the auditory system that is believed to trigger the condition, such as the outer ear, middle ear, organ of Corti, auditory nerve, and brainstem or central pathways.
3. Self-reported description as to whether the sounds are heard in the ears or more centrally in the head.
4. Physician’s reported observation of the patient. This could include the age of the patient or the impact the presence of tinnitus has on the patient.
5. Classification according to psychoacoustic measurements of tinnitus. This was mainly based on Feldmann’s (1971) investigations that explored the effect of masking techniques on tinnitus.
6. Classification according to associated phenomena. This included the type of hearing loss (if any), presence of vestibular abnormalities, and sounds generated in the inner ear.
7. Classification in response to treatment. The types of treatment listed included those for Ménière’s disease, psychological counselling, medication, masking, electrical stimulation and surgery.

The many early attempts to classify tinnitus further highlights its symptomatic nature and how establishing a one-method-cure-all management strategy is almost impossible. More recent clinical guidelines (Tunkel, 2014) differentiate between primary tinnitus (idiopathic tinnitus that may or may not be associated with sensorineural hearing loss) and secondary tinnitus (associated with causes other than sensorineural hearing loss). The guidelines also recommend understanding other aspects of tinnitus, such as the onset of tinnitus and whether or not the condition is bothersome. This may help to tailor the appropriate management strategies to the individual tinnitus sufferer.

The often persistent nature of tinnitus together with the inability of identifying a method to halt the tinnitus may inadvertently affect a person’s quality of life and contribute to stress and worry. This in turn could result in unintentionally paying more attention to the tinnitus and therefore cause a vicious cycle that is strengthened by both the attention to and annoyance of the sounds that are heard. A number of management strategies involving education, counselling and cognitive behavioral therapy aim to break this feedback cycle through habituation, acceptance and mindfulness techniques. The use of sound therapy (i.e., masking of the tinnitus) as well as amplification, where required, can provide some amount of relief from the condition.

Masking the percept of tinnitus is not a novel concept, as noted previously. It typically involves listening to externally generated or naturally occurring sounds that are more acceptable to the patient than the sound of their tinnitus. Masking devices (wearable or otherwise) have been demonstrated to provide some relief to people with tinnitus (Hazell & Wood, 1981). The management strategy with masking devices alone, however, may not be as robust as when combined with education and counselling sessions. Henry and colleagues (2006) compared the use of masking and Tinnitus Retraining Therapy (TRT), which uses a combination of masking, structured education and counselling sessions. The management of tinnitus using masking techniques typically involves a minimal amount of education and counselling, and the patients are instructed to make adjustments to the volume of the tinnitus masker so that it provides the most relief, consequently providing either complete or partial masking to their tinnitus. The TRT strategy, on the other hand, emphasizes habituation. Patients are instructed to make adjustments to the tinnitus masker so that the volume of the tinnitus masker is at a point where the tinnitus and the masking noise begin to mix together. Structured education and counselling sessions are also provided throughout the habituation process. The authors observed that comparatively, tinnitus maskers provided faster relief in the short term, while the use of TRT tended to have a larger long-term benefit to the tinnitus patient.

Cognitive Behavioral Therapy (CBT) approaches, however, have been shown to provide the most robust results to date in improving the quality of life measures in people with tinnitus. The aim of cognitive behavioral therapies is to help the tinnitus patient modify harmful thoughts and behaviors toward the tinnitus percept using “deconditioning” techniques. Comparative studies between the habituation therapy of TRT and deconditioning or coping techniques used by CBT have demonstrated a greater effect in the improvement of the quality of life measurements for tinnitus patients using CBT (Zachriat & Kröner-Herwig, 2004). Consequently, the current clinical guidelines strongly recommend the use of CBT for patients with persistent, bothersome tinnitus (Tunkel, 2014).

In the absence of any medical abnormalities, the presence of tinnitus is typically benign and has been reported by people with good hearing.
Heller and Bergman (1953) studied the presence of tinnitus in people with normal hearing. In their study, they asked about 80 adults between the ages of 18 to 60 with no perceived hearing loss or tinnitus to enter a sound-treated booth (ambient noise level between 15 to 18dB SPL) and provide written details about sounds that they could hear within a 5-minute observation window. The researchers made no suggestions to the participants that the source of the sounds may originate from the participants themselves. About 95 percent of the participating 80 adults noted humming, buzzing, and ringing noises. The authors rationalized that “tinnitus” may always be present in people with normal hearing and is only more noticeable in very quiet environments. They reasoned at the time that day-to-day ambient noise levels typically exceed 35dB SPL, which is enough to mask the presence of tinnitus in people with good hearing. Del Bo and colleagues (2008) repeated the experiment 55 years later in a group of 53 normal-hearing young adults between the ages of 19 to 29 and reported similar findings.

The observation that tinnitus can be perceived by people with normal hearing in quiet environments sparked a number of subsequent research studies that questioned the role of inhibitory responses in the generation of the tinnitus percept. Roberts and colleagues (2010), for instance, attributed the presence of tinnitus to a shift of balance between the inhibitory and excitatory responses, resulting in neural hyperactivity in parts of the brain that process sounds. The brain misinterprets these signals as sounds that can be “heard” and inadvertently gives rise to the percept of tinnitus. Hearing impairment has been hypothesized to be one of the main causes of hyperactivity in the hearing pathway that can be present specifically in the dorsal and ventral cochlear nuclei, the inferior colliculus, and the primary and secondary auditory cortices. The site of hearing impairment that triggers the cascade of events that give rise to tinnitus, however, is still speculative and needs to be better understood.

Tinnitus continues to make its presence in the modern world and may impact the quality of life of the people who perceive it. It is symptomatic in nature, which means that it could be related to the variety of conditions like hearing loss or other lesser known conditions. The research community has made strides over the last few decades to understand the conditions that trigger the percept as well as the mechanisms that may be involved in its generation. Although it currently isn’t possible to completely eliminate the percept of tinnitus, its presence can be managed to provide an improvement to the quality of life of those who are bothered by the condition.
References


