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Tinnitus—New challenge and therapeutic approaches

Tinnitus is defined as subjective perception of a sound in the absence of an external sound source.

Tinnitus is commonly associated with noise exposure, the aging process, and stress [6, 11, 12, 15, 19] and infrequently with neurological or infectious conditions and drug-related side effects [22]. In addition, tinnitus is often associated with other comorbidities such as depression, anxiety disorders, and somatoform disorders [23–25].

In terms of therapy, the distinction between bothersome (distressing) tinnitus and non-bothersome (non-distressing) tinnitus is relevant. Bothersome tinnitus refers to a negative emotional and auditory experience that is related to an actual or a potential physical or mental harm [7].

» Tinnitus is the most common chronic auditory disorder

Tinnitus is the most common chronic auditory disorder [16] and owing to the high prevalence rate, the economic impact of tinnitus on the health-care system is relatively high [4, 13, 21].

Most studies indicate that tinnitus prevalence rates range between 10 and 15% of the adult population [2, 4, 8]. The prevalence of tinnitus increases with age and includes approximately one in three older adults [1, 17, 20]. Moreover, according to various studies, the problem of hyperacusis (reduced tolerance toward everyday noises) in the tinnitus population affects 40–55% of patients [3, 18].

Of all persons affected by tinnitus, one third describe tinnitus as disturbing or very disturbing. The prevalence rate is reported to be 4% in severe tinnitus and 6% in low-to-moderate tinnitus [13].

According to current knowledge, peripheral and central structures are involved in the development of tinnitus, tinnitus persistence, and tinnitus suppression [9].

For example, after noise exposure, experimental studies using animal models show a reduced spontaneous firing rate in the auditory nerve and an increased spontaneous firing rate in the cochlear nucleus, colliculus inferior, and auditory cortex. In addition, increases in neuronal synchronicity are found in the inferior colliculus and auditory cortex. Tonotopic map changes are demonstrated experimentally in the auditory cortex in animals, but are not confirmed as neural correlates of human tinnitus [10].

From a clinical point of view, tinnitus can be seen as the result of a defective hearing process, which can be fostered by hearing disorders themselves and by stress influences [14, 15]. Consequently, whether or not the tinnitus is disturbing does not depend on the degree of hearing loss but is always determined by the interaction between central auditory processing, the vegetative and limbic nervous system, and cognitive processing [5].

An important approach in tinnitus therapy is that the auditory perception includes emotional and reactive systems. Therefore, tinnitus therapy is not concerned with the elimination of tinnitus, but with the redirection of perception and subjective assessment as well as with the treatment of comorbidities. This ultimately leads to a compensation and habituation of tinnitus, to the reduction of

the patient's suffering, and thus to the improvement of quality of life.

In addition to current basic aspects, the focus in these special issues (March and May issue of *HNO*) is on the central impacts of noise and regeneration approaches, particularly on findings of hyperacusis, behavioral approaches in tinnitus therapy, long-term effects of multimodal therapies, treatment of comorbidities, app-assisted approaches in tinnitus treatment, and the influence of cochlear implant (CI) treatment on tinnitus cognition.

» The main challenge is to develop a causative therapy for tinnitus

Nevertheless, the main challenge, which has not yet been solved, is to develop a causative therapy for specific subgroups of tinnitus. As a future prospect, great hopes are placed on progress in molecular and cell biology therapy in all medical therapies as well as in the field of hearing systems. Owing to the close connection between the ability to hear and tinnitus, research focuses on new possibilities of protection, repair, regeneration, or directly influencing vulnerable structures of the hearing system or of extra-auditory associated structures.

The articles in these issues with the main focus on “Tinnitus” give you a broad overview of the different subject-specific aspects and approaches in tinnitus research and therapy.

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