

The Multidisciplinary Tinnitus Clinic **at the University of Regensburg**

www.tinnituszentrum-regensburg.de

Veronika Vielsmeier^{1,3}, Peter Kreuzer^{2,3} and Berthold Langguth^{2,3}

¹ Department of Otorhinolaryngology

² Department of Psychiatry and Psychotherapy

³ Tinnitus Center at the University of Regensburg

Most people experience an occasional and transient perception of sound in their ears or head although no external sound source is present (Eggermont and Roberts 2004). Typically, this perception is reversible and subsides approximately between a few seconds to a few days. However, in about 5 to 15% of the adult general population these phantom sounds are perceived chronically (Axelsson and Ringdahl 1989; Hoffman and Reed 2004), approximately 1% of the population reports severe impairment of daily living (Harter, Maurischat et al. 2004) and seek medical help (Coles 1984).

Treating patients with chronic tinnitus remains a complex challenge. Tinnitus can have many etiologies including hearing loss, temporomandibular disorders, trauma to the neck or head or emotional trauma. Also the manifestation of tinnitus can vary. The sound can have many forms and tinnitus is frequently accompanied by hyperacusis, phonophobia, auditory perception disorder, anxiety, depression or insomnia. Thus, chronic tinnitus represents a symptom located in between a multitude of different specialities and its diagnostic and therapeutic management requires a multidisciplinary approach. In order to meet this requirement, the Interdisciplinary Tinnitus Center of the University of Regensburg (Southern Germany) has been founded as a multidisciplinary center for comprehensive diagnostic assessment, treatment and clinical research.

Who comes to the Tinnitus Clinic and how ?

Appointment Inquiries : Patients suffering from chronic tinnitus (duration of at least 3 months) can make an appointment in our tinnitus clinic. No specific conditions concerning diagnostic or therapeutic arrangements in the past are necessary, but patients are asked to bring along all medical documentation sources available to them with special emphasis on prior audiograms, doctor's letters concerning trauma history or any available CT and/or MRI scans.

Information Sources and pre-consultation Assessment: Some of our patients came to know about the Interdisciplinary Tinnitus Center by media reports or from family members or

friends, other patients are directly recommended an appointment by ENT doctors or general practitioners. Already before consultation patients receive a compilation of standardized questionnaires concerning their tinnitus, their quality of life and potential comorbidities by mail. They are kindly asked to fill out the different questionnaires carefully and to present at the Tinnitus Center with that set of data. The questionnaires are analyzed during the consultation date to provide a first general overview about the patients's complaints.

How is the Multidisciplinary Tinnitus Clinic organized ?

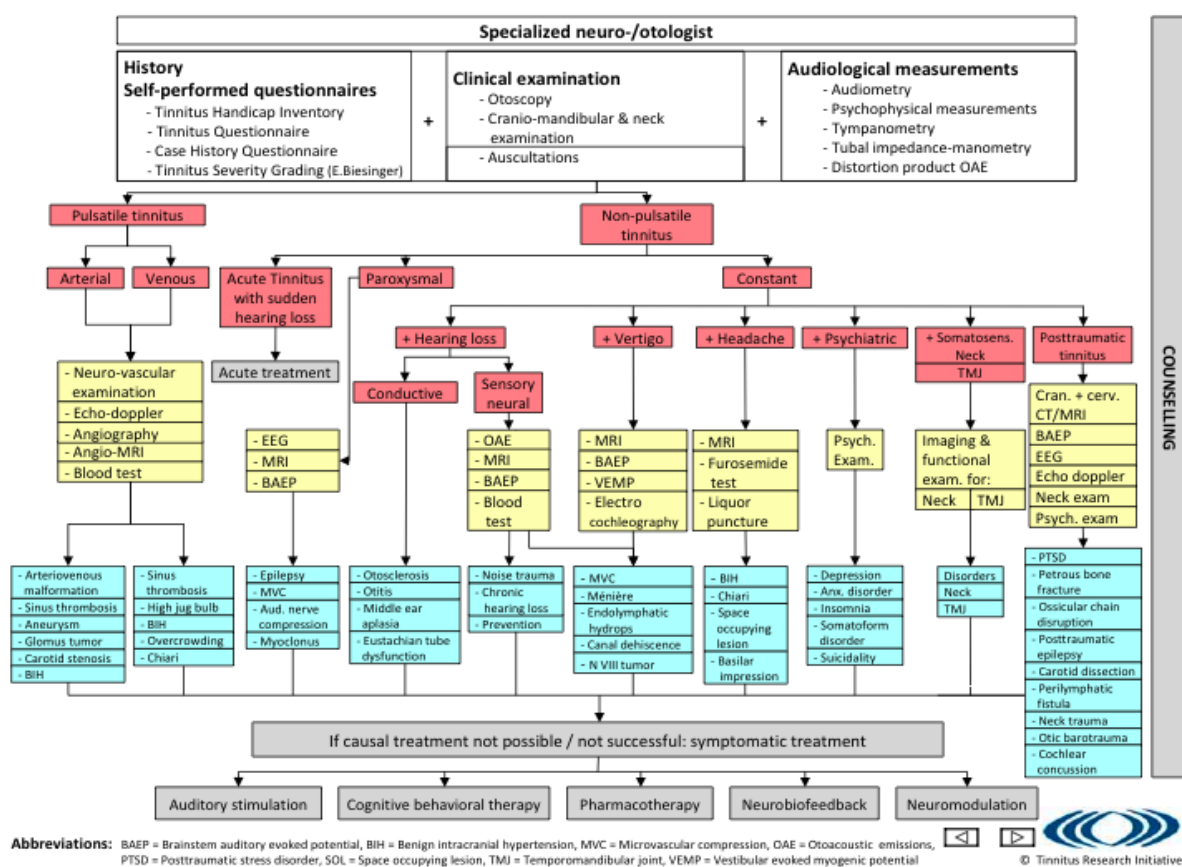
The multidisciplinary Tinnitus Clinic is based on a close collaboration between the Department of Otorhinolaryngology (including Audiology) and the Department of Psychiatry and Psychotherapy. Furthermore, the Departments of Dentistry and Physiotherapy are involved. In specific cases radiological or neurological experts' opinions are further provided for an extended diagnostic assessment.

Each Tuesday six new patients are seen by specialists from the different disciplines and their management is discussed in a case conference in the afternoon. Treatment and follow-up visits take place in the specific specialized clinics.

The responsibility and the financial administration of each diagnostic and therapeutic intervention lies at the performing speciality. This organisational form was deduced from the organisation of multidisciplinary pain clinics and enabled the establishment of the multidisciplinary Tinnitus clinic relatively easy in the context of the existing out-patient departments of the involved clinics. The real value of this organisational _or mis the standardized multidisciplinary management by a multidisciplinary closely collaborating team

Diagnostic Assessment

The diagnostic assessment at the Interdisciplinary Tinnitus Center follows a standardized and step-wise approach. This approach is based on a treatment algorithm developed by the Tinnitus Research Initiative (http://www.tinnitusresearch.org/en/projects/flowchart_en.php)



Detailed tinnitus-specific anamnesis includes questions concerning the duration and localisation of the tinnitus but also questions for potential causal events, and triggering factors of the tinnitus perception. Furthermore, the character and the ability to modulate the tinnitus by somatosensorial manoeuvres or the existence of related symptoms like vertigo, dizziness, etc., are asked for. Possible traumatic events or pathologies of the temporomandibular joint and of the cervical spine can be reliably excluded by a detailed anamnesis. Also psychological factors and conditions such as tinnitus modulation by psychosocial distress but also psychiatric comorbidities such as depression, anxiety or delusional disorders are paid attention to.

A systematic anamnestic approach is facilitated by the above mentioned questionnaires which indicate the characteristics of the tinnitus and may be used to rate the patient's complaints initially. Based on this information areas of interest are targeted in more detail during the exploration. An important part of the case history is the question, what bothers the patient most about its tinnitus. The answers vary highly ranging from *communication* – or *concentration problems* over *sleep disorders* to *worry about worsening* or the complaint of *having lost quietness*. Information about the subjectively most impairing symptom is an important orientation for individual treatment.

After the detailed case history the patient undergoes a complete otorhinolaryngological examination including otoscopy. Hereby, pathologies of the external ear or the middle ear are to be assessed. It is followed by a detailed audiological assessment. Individual hearing loss for frequencies from 125 Hz to 16 kHz is determined, the patients undergo both tone and

speech audiogram testing. For detailed assessment of tinnitus characteristics an audiological matching (of character and frequency) is conducted and tinnitus masking levels (by white noise for graduation of loudness) are determined. In case of vertigo also a neuro-otological examination including electronystagmography is performed to exclude any vestibulopathies. According to the findings from the case history and the initial ENT- and audiological examination the patient is referred to other specialities. In case of suspected temporomandibular joint (TMJ) problems the patient is presented to a specialized dentist, in case of suspected vascular abnormalities or for ruling out tumors of the auditory nerve further neuroradiological investigations such as computer tomography of the temporal bone, magnetic resonance tomography of the brain, duplex sonography or angiography are initiated. If the patient complains of abnormal muscle tension or pain in the neck, an examination by a physiotherapist is added. Finally most patients are further referred to the psychiatric clinic for neurological, psychological and psychiatric assessment.

Therapeutic options

As different the causes and the individual complaints of the patients, as various are the options of therapy. In general, it is important to differ between causal strategies to eliminate the tinnitus source and on the other side supporting treatment strategies aiming at habituation of the tinnitus and thus leading to an improvement of quality of life.

It is our belief, that a potential specific underlying pathology of tinnitus should be looked for and ruled out, before symptomatic treatment is started. Especially in cases of pulsatile tinnitus such a diagnostic approach is important, even if specific underlying pathologies can only be detected in a minority of cases. However in those cases causal therapeutic options may be available for example by eliminating a glomus tumor or relieving spasmic contractions of the muscles of the middle ear. In addition, the elimination or amelioration of hearing loss (which is often associated with tinnitus complaints) can be considered as a causally oriented treatment strategy of chronic tinnitus. This can include the allocation of hearing aids or surgical interventions in the case of otosclerosis.

In many cases casally oriented treatment is not possible, so the main goal is to achieve an improvement of the individual handicap caused by the tinnitus. In many cases a significant reduction of tinnitus complaints can already be obtained by a comprehensive explanation about tinnitus including its etiology and prognosis. This form of specific information brokering helps to reduce inappropriate worries and fear and is called «tinnitus counseling». The patient needs to be taken serious. Empathy and time are essential requirements for a successful therapeutic relationship with the patient, which in turn is the basis for providing hopeful perspectives for the – sometimes desperate –patients.

In cases where tinnitus does not cause any significant reduction of individual quality of everyday life and after exclusion of relevant underlying pathologies (e.g. acoustic neurinoma) no further therapeutic activities are needed. In other cases treatment strategies aiming at better habituation of the tinnitus consisting of counseling, sound therapy (e.g. noiser or hearing aids) or cognitive behavioural therapy may be useful. If patients suffer from psychiatric comorbidities we strongly recommend specific treatment either by psychotherapy or by pharmacotherapy or a combination of both. Also tinnitus related insomnia can frequently be sufficiently treated by sedative antidepressants.

In many cases patients also ask for information about various unconventional treatment approaches. Serious information about their effectiveness and their risks is highly appreciated by many patients.

As a consequence of current knowledge about the pathophysiology of tinnitus during the last years innovative therapeutic approaches became more and more relevant. These new treatment approaches aim to target the neuronal correlate of tinnitus directly. Transcranial magnetic stimulation (TMS) may serve as an example. It consists of a technique providing a strong and focal magnetic field by a coil. The magnetic field penetrates the skull easily and painlessly and leads to depolarization of neurons in cortical regions. By repetitive TMS application a persisting modulation of neural activity and thus an alleviation of tinnitus complaints can be achieved in a subgroup of patients. The newly developed treatment strategies such as brain stimulation or specific forms of auditory stimulation aims to counteract tinnitus related changes in the brain. Even if these treatment strategies are still at early stages in their development and not yet available in routine treatment, they indicate that causally oriented treatment is possible and provide a glimpse of hope that more and more effective treatment strategies will become available in the next years.



The importance of multidisciplinary

The multidisciplinary approach is the core of our tinnitus management concept. Since the challenges of tinnitus management are not covered by any single speciality close collaboration across specialities is highly important. Only such a multidisciplinary approach provides the possibility of an individualized and step-wise diagnostic and therapeutic management. The Interdisciplinary Tinnitus Center at the University of Regensburg tries to follow that conceptual strategy. After a consultation day the management of each patient is discussed in a case conference. In this case conference an individual and step-wise treatment concept is developed for each patient based on diagnostic findings and different experts' opinions. A letter with a summary of diagnostic findings and the therapeutic recommendation is sent to the patient and the referring physician. This case conference also serves an important educational function since representants from the different disciplines learn more about the other involved specialities.

Clinical Research

In addition to the multidisciplinary clinical management the Tinnitus Clinic provides an excellent infrastructure for clinical research. This is of high importance since the development of new treatments requires the performance of clinical trials at high methodological standards. Also here the multidisciplinary approach is advantageous, resulting in more than 60 scientific publications in the last 10 years. A large network of international collaboration facilitates both the clinical and scientific work. This cooperation is mainly realized in the context of the „Tinnitus Research Initiative“ (TRI) which constitutes a private foundation aiming for a closer interdisciplinary connection of the scientific tinnitus community (www.tinnitusresearch.org). One important result of this international network was the edition of the “Textbook of Tinnitus” 2011 (<http://www.springer.com/medicine/otorhinolaryngology/book/978-1-60761-144-8>).

The TRI Database

There is agreement among tinnitus experts that there exist different forms of tinnitus. It is also assumed that these different forms differ in the underlying mechanisms and in their response to specific treatments.

For a better understanding of the different forms of tinnitus patients data of the Tinnitus Clinic Regensburg are collected together with data from other Tinnitus Clinics within the TRI network in the TRI database (<http://database.tinnitusresearch.org/>). Data storage is effected in a pseudonymized way, data handling and its statistical analysis is performed according to high quality standards. This database provides information of the prevalence rate of specific

tinnitus characteristics (e.g. headache or TMJ complaints) among tinnitus patients, it enables to identify relationships between those characteristics (e.g. is tinnitus started after a trauma more bothersome) and can finally identify subforms of patients by cluster analysis. Assessment of tinnitus before and after specific interventions helps to identify the effectiveness of specific interventions in subgroups of tinnitus patients. This continuously growing database contains currently information from over 3500 patients.

Summary

Treating tinnitus patients remains a complex challenge in many cases. Therapeutic management is usually burdened by the fact that tinnitus with its many aspects is located in between many different specialities. Therefore, a multidisciplinary approach with consistent discussion of both the diagnostic findings and the outcome of different treatment approaches is highly desirable and recommended. The Multidisciplinary Tinnitus Center of the University of Regensburg follows such a concept aiming at the development of individualized and step-wise treatment strategies for each patient suffering from tinnitus.

Acknowledgement

First and foremost we thank our patients who trust us and provide us with detailed information about their tinnitus in order to facilitate systematic clinical research in the field of tinnitus. We want to thank all the supporters, co-workers and colleagues collaborating in the establishment of our interdisciplinary approach worldwide.

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