Dear Colleagues,

We are proud to present the collected abstracts of the **3rd World Tinnitus Congress** and the **XIV International Tinnitus Seminar**.

Tinnitus research meets with growing social and clinical interest, as the number of people suffering from tinnitus is growing steadily worldwide. The patients and therapists demand strategies and therapies to prevent and alleviate tinnitus. The Organizers of this Congress aim to bring together scientists and clinicians to discuss the latest ideas, results, and challenges and to spark new insights for research and clinical work.

We welcome you to the Congress and wish you a successful meeting!

Prof. Henryk Skarzynski, MD, PhD, dr. h.c. multi
President

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The Tonndorf Lecture

Cognitive behavioural therapy (CBT): from the Greek stoics in the first millennium BC to the modern medicine for treatment of tinnitus and sound intolerance

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Tinnitus is the perception of sound(s) in the absence of acoustic stimuli, while hyperacusis and misophonia can be defined briefly as the perception of certain sounds as too loud (for hyperacusis) or as extremely annoying (for misophonia). When tinnitus, hyperacusis, and misophonia cause significant distress and impairment in the individual's social, occupational, recreational, and other day-to-day activities, then they are classified as tinnitus disorder or clinical hyperacusis/misophonia, respectively, which warrants therapeutic interventions. One of the most evidence-based interventions for management of the distress caused by tinnitus, hyperacusis and misophonia is cognitive behavioural therapy (CBT). The philosophical underpinnings of CBT can be traced back thousands of years to the time of the Greek Stoics, who believed that destructive emotions result from errors in judgment. In CBT, the distress caused by tinnitus or certain sounds (in the case of hyperacusis/misophonia) is conceptualised in the following way. Tinnitus/certain sound(s) can trigger an initial reaction that encompasses emotions, bodily sensations, and behaviors. This initial reaction is often followed by automatic thoughts and appraisal of those thoughts which leads to follow-on reactions that also have components related to emotions (e.g., fear or disappointment), behaviour (e.g., avoiding certain places or activities or reassurance seeking) and bodily sensations (tension or palpitations). The follow-on reactions may lead to further evaluative thoughts which will feed back to the reactions, creating a vicious cycle of distress. When tinnitus or certain sounds trigger the vicious cycle, this brings them to the focus of attention as opposed to allowing the habituation process to take place. CBT helps the patients to understand and modify the relevant cognitive processes and behavioural patterns in order to break the vicious cycle of tinnitus/hyperacusis/misophonia-induced anxiety and annoyance. The aim of this Tonndorf Lecture is to reflect on the theoretical and philosophical underpinnings of CBT and its application for management of tinnitus and sound intolerance, the progress to date regarding providing CBT in clinical practice for this population, and the actions needed to further that progress in future.

Dr. Hashir Aazh PhD is the director of Hashir International Institute for Misophonia, Tinnitus & Hyperacusis. He has published over 60 research papers in the field of audiology. He is the founder of the biennial International Hyperacusis and Misophonia Conference.

Invited Lecture

Neurobiology of tinnitus and hyperacusis

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According to conservative estimates, tinnitus causes annual socio-economic costs (e.g. in Germany) of almost 22 billion euros (around 4,800 euros per patient), mainly due to twice as many sick days (26 days) as the average in the population (11 days) by tinnitus patients. To date, there is no causal tinnitus therapy, probably due to a lack of differentiation between tinnitus with and without hyperacusis, which has made it difficult to identify a neuronal correlate of tinnitus. Important in the context that it is mainly tinnitus patients with hyperacusis who suffer significantly more from their disease and therefore primarily require therapy. (Knipper et al., J Neuroscience 2020; Knipper et al., JARO 2022). Using objective diagnostic procedures and a differentiation step of tinnitus without and with hyperacusis, an impairment of fast (high-SR) auditory processing was proposed as a neural correlate of tinnitus, that via a loss of tonic inhibition in feedforward and feedback PV-IN networks through reduced noise suppression and reinforced attention to the resulting noise in the affected frequency region makes tinnitus explainable (Knipper et al., J Neuroscience 2020; Knipper et al., JARO 2022). Our aim here is to better identify the intracortical network changes in the auditory and associated brain regions (if with or without hyperacusis) using the high-resolution time-sensitive

MEG-OPM technique. We are explicitly interested in whether and how specific peripheral cochlear synaptopathies can cause attention-controlled perceptual disorders such as tinnitus and hyperacusis via changing resting or evoked high-frequency brain oscillation patterns, the prerequisite to use this diagnostic approach for screening for individualized, targeted interventional therapies.

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Workshops

Assessment and management of tinnitus and hyperacusis in children

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Although tinnitus and hyperacusis are often considered a problem associated with adulthood, they are also observed in children and young people, with prevalence estimates suggesting that approximate 3% of children can experience either. Tinnitus and hyperacusis cause problems in many different aspects of life, such as psychological health, cognitive performance and isolation and in different areas of life such as home and school. Despite this, tinnitus and hyperacusis in children are relatively unrecognised problems with resources for assessment and management often being adult based.

The aim of this workshop is to provide an update on the current position of research on tinnitus and hyperacusis in children. It will highlight the problems reported by children and young people. Whilst there are many questionnaires available to measure different aspects of tinnitus complaint in adults, until recently, there were no self-report questionnaire measure of tinnitus or hyperacusis that has been developed for or is suitable for use with children. This workshop will introduce the newly developed self-report measures of tinnitus and hyperacusis impact for use by children and young people aged 8-16 years old (Impact of Tinnitus in Children Questionnaire (iTICQ) and Hyperacusis in Children Questionnaire (HICQ). Use of these self-report measures can support clinical practice by highlighting the specific impacts of these conditions on the individual child and young person to both facilitate discussions with children/ young people and parents in clinical appointments and inform decisions regarding the most appropriate treatment.

The keynote lecture within this session will provide an update on the UK guidance for management of tinnitus in children based on the UK National Institute for Health and Care Excellence Guidelines on Tinnitus Assessment and Management and the British Society of Audiology's multidisciplinary Practice Guidance on Management of Tinnitus in Children currently in redevelopment. The Practice Guidance aims to provide guidance on a child friendly approach to assessing a child or young person with tinnitus, practical supportive strategies and a toolkit of resources to help children and young people manage troublesome tinnitus.

How can we learn about tinnitus neuro correlates from our daily observations? Interactive workshop

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In this interactive workshop, we will discuss how our daily observations can give us insight to neural correlates of tinnitus. We will discuss topics comprising e.g: (i) Is it true that tinnitus does not occur with congenital deafness? (ii) Is it correct that tinnitus occurs in CI-implanted children and adults when the CI is turned off? (iii) Are or are not these phenomena related to the so-called Heller and Bergman experiment from 1953, which states that almost everyone in a soundproof chamber experiences tinnitus? The aim is to provide an engaging session and encourage participants to discuss and share their views and experiences about the connections between tinnitus and how it develops. The workshop instructors will facilitate the discussions and introduce the topics.

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Introduction to audiologist-delivered cognitive behavioural therapy (CBT) for tinnitus, hyperacusis and misophonia

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Tinnitus is the perception of sound(s) for which there is no identifiable corresponding acoustic source. Hyperacusis is the perception of certain everyday sounds, such as domestic noise or noise in public places, as too loud or painful in such a way that it causes significant distress and impairment in social, occupational, recreational, and other day-to-day activities. Misophonia is defined as the experience of

extreme annoyance, disgust, anger, and anxiety when hearing one or more specific sounds often related to chewing, lip smacking, breathing, and so on. Several studies support the efficacy of cognitive behavioural therapy (CBT) for the rehabilitation of patients with misophonia, hyperacusis and tinnitus. In this workshop, a programme of audiologist-delivered CBT comprising 14 therapy sessions will be introduced. This is a specialised therapy for tinnitus, hyperacusis and misophonia rehabilitation and comprises four stages: I) Assessment, II) Preparation, III) Active treatment, and IV) Maintenance stage. The content of the intervention is consistent with the key CBT theories and methods. However, unlike general CBT, the strategies used in these 14 sessions are fine-tuned to address the issues that are specific to the distress caused by the tinnitus, hyperacusis, and misophonia. The first 10 sessions are weekly. Then the gap between the sessions increases to 2 weeks, 1 month, 3 months, and 6 months. Each session lasts between 45 and 60 minutes. The content of the therapy briefly comprises (1) education about tinnitus, hyperacusis and misophonia and relevance of CBT, (2) enhancing patient's motivation to engage with the therapy process, (3) setting goals, (4) formulation, (5) identifying upsetting automatic thoughts, (6) identifying avoidance and ritualistic behaviors, (7) SEL (Stop Avoidance, Exposure, & Learn from it), (8) KKIS (Know, Keep on, Identify, Substitute), (9) identify and challenge deeper thoughts and beliefs, and (10) integrating CBT into lifestyle (CBStyle).

Keynote Lectures

Children's Tinnitus Questionnaire

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Introduction: Tinnitus in children occurs more frequently than is diagnosed. If a child, accompanied by guardians, reports experiencing tinnitus, it indicates that it is clinically significant and requires further diagnostics. Tinnitus is usually subjective, and questionnaires are used to assess the severity of tinnitus.

Aim: The aim of this work is to present process of creating and promoting the Children's Tinnitus Questionnaire.

Material and methods: The development of the tool consisted of several stages. After a pilot study involving 12 children suffering from tinnitus, a validation study was conducted with 192 children aged 11 to 14 years with tinnitus. The children underwent audiometric testing, completed the Visual Analog Scale (VAS), and filled out the beta version of the questionnaire.

Results: As a result of the validation process, a new 11-item questionnaire concerning tinnitus in children was created. It includes items related to the impact of tinnitus on functional, cognitive, emotional, and social spheres. The validity of the new tool was established by finding significant correlations between it and the VAS loudness ($r = 0.42$), VAS annoyance ($r = 0.67$), and VAS coping ($r = -0.41$). Validity was also confirmed by measuring differences in CTQ scores among four groups of children with graded frequencies of tinnitus. Internal consistency, assessed using Cronbach's alpha, was high ($\alpha = 0.82$).

Conclusions: The Children's Tinnitus Questionnaire is the first fully validated, multi-item tool designed specifically for children. The questionnaire can provide essential insights and foster better strategies for prevention, treatment, and, improved outcomes for children with tinnitus.

COVID-19 and tinnitus

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COVID-19 is a respiratory disease caused by the new coronavirus SARS-CoV-2, for which the first cases were reported in China, by December 2019. The spectrum of clinical presentations is wide, ranging from asymptomatic cases to a severe acute respiratory syndrome, sometimes with multiple systems involvement. Viral infections, including those related to respiratory virus, may cause hearing loss and, by extent, considering its pathophysiology, tinnitus. The lecture will provide a comprehensive review on COVID-related tinnitus, its prevalence along the pandemics timeline, effects of vaccination, vaccine-related tinnitus and the speaker personal experience on the subject, supported by published data and ongoing research.

Facts and fables of TMD-related somatic tinnitus

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Somatic tinnitus (ST) is pathophysiologically linked to neural activity in connecting fibers between the dorsal cochlear

nucleus (DCN) and the somatosensory medullary nuclei. This mechanism may explain the relatively high prevalence of tinnitus among patients with temporomandibular disorders (TMD) (30.4–64%) and suggests that TMD treatment could benefit individuals with ST. However, managing TMD can be complex, as multiple healthcare providers offer various treatment approaches, making it difficult for clinicians to determine the most appropriate referral pathway. Despite increasing interest in this field, misconceptions persist regarding the diagnosis and management of TMD-related somatic tinnitus. This presentation aims to distinguish evidence-based knowledge from common myths, providing a critical evaluation of the current understanding of its pathophysiology, diagnostic criteria, and treatment strategies while addressing prevailing misconceptions. Conclusions: While TMD-related somatic tinnitus is a recognized condition, misconceptions persist regarding its mechanisms and management. This presentation highlights evidence-based insights and challenges widespread myths, emphasizing the need for interdisciplinary diagnose and treatment.

Intratympanic injections in tinnitus

Elzayat S.

ORL-HNS, Kafelsheikh University, Kafr El Sheikh, Egypt

Tinnitus is annoying sensation and has no definite treatment due to varies mechanisms of pathogeneses. One modality of treatment is local medication by intratympanic injections. We experienced two clinical trials for this point. I will demonstrate this object in my talk.

Medical treatment of tinnitus: evidence-based evaluation

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Although tinnitus has a prevalence between 20 and 48%, the currently recommended management for tinnitus, such as tinnitus support and psychologic therapies, are relatively time-consuming and expensive. Several new pharmacologic treatments designed for tinnitus patients without specific origin had been developed but their efficacy remains unclear. We will conduct a review about the latest drugs used in primary tinnitus and the results in brief.

Personality traits and pharmacological treatment with Olanzapine: a double blind study

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Introduction: Psychological factors were previously related to tinnitus perception and distress, playing a modulatory role. Previous work demonstrated that personality traits may be a predictor of the severity of tinnitus, with impact on the individual response to tinnitus measuring personality, behavior and neurobiological techniques. The big Five model can classify personality traits in order to be evaluated neuroscientifically. Several medications have been used over the last few decades to treat tinnitus, always with partial results. To date, there is no medication approved by the FDA for the treatment of tinnitus; all medications used have been prescribed "off-label". Glutamate antagonists, GABA agonists, dopaminergic agonists and antagonists and serotonergic antagonists have already been evaluated in several studies, with results that are often not replicated, which may be the result of methodological differences, but also the heterogeneity of tinnitus itself. Olanzapine is an antipsychotic drug with a broad pharmacological profile, through action on several receptor systems. In preclinical studies, olanzapine demonstrated affinity for serotonin receptors 5HT2A/C, 5HT3, 5HT6; dopamine D1, D2, D3,D4, D5; muscarinics M1-5; a1-adrenergic and histamine H1. Olanzapine is well absorbed after oral administration, reaching maximum plasma concentrations within 5 to 8 hours. The perception of tinnitus occurs in the prefrontal region, temporal region and temporoparietal association areas, as well as in the Limbic System. Dopaminergic neurotransmitters are present in these same areas responsible for the perception of tinnitus, which control attention, stress, emotions, learning, memory and motivational behavior.

The dopaminergic pathway can be modulated by receptors and their agonists and antagonists, reducing the perception of tinnitus.

Dopamine (DA) and norepinephrine (NE) have been repeatedly implicated in neuropsychiatric vulnerability, in part through their roles in mediating decision-making processes. [Cathy Chen et al, August 2024]

Aim: To analyze tinnitus severity amongst different personality traits. Personality neuroscience indicates that differences between individuals related to thoughts, cognition, motivation and emotion imply different patterns of brain functioning. The model of the 5 personality factors known as Big Five

or Five Factor Model (FFM) has offered hypotheses serving as a guide for research in personality neuroscience. Research in the field of personality has employed several methods.

Material and methods: Fifty tinnitus patients with tinnitus lasting for at least 6 months filled out the questionnaires NEO-FFI and THI, and also VAS scales for volume and distress and Clinical Global Impressions Scale (CGI). The THI and VAS scores were statistically correlated to the personality traits. The drug treatment chosen was olanzapine at a dose of 5 mg daily for 3 months. The research lasted 7 months, being cross over against placebo with a 1 month wash out.

Results: Most frequent personality trait scored was neuroticism (36% high and 32% very high). For the other four personality traits, high and very high scores ranged from 16% to 18%. No correlation was found concerning VAS for distress. Graph 1 shows correlation between VAS for volume and the traits and Graph 2 between THI scores and the traits. For statistical reasons, patients with neuroticism trait were divided in subgroups "Low" (including very low, low and medium; in blue), "High" (in orange) and "Very High" (in green), while the other traits were divided in subgroups "Low" (including very low and low; in blue), "Medium" (in orange) and "High" (including high and very high; in green). Olanzapine treated period: Significant effect of the "time" component. Significant reduction from the initial to the final moment in the VAS volume ($p < 0.0001$), in the VAS nuisance ($p < 0.0001$), in the CGI ($p = 0.002$) and in the THI ($p < 0.0001$), regardless of the initial drug. Association of personality traits with response to olanzapine treatment. It was possible to observe clinical trend (12 patients off):

- VAS volume and discomfort drop > 50% – more significant improvement, high level of neuroticism, agreeableness and conscientiousness;
- THI drop > 50% – significant improvement, high level of neuroticism and conscientiousness.

Somatosensory tinnitus: recent developments in diagnosis and treatment

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Somatosensory or somatic tinnitus (ST) is a type of tinnitus where changes in somatosensory input from the head-neck area are one of the influencing factors of a patient's tinnitus. As there are often several influencing factors, identifying a clear somatosensory influence on an individual patient's tinnitus is often a challenge. Therefore, a decision tree using four clinical criteria has been proposed that can help diagnose ST with an accuracy of 82.2%, a sensitivity of 82.5%, and a specificity of 79%. Once correctly diagnosed, patients can be successfully treated using a musculoskeletal physical therapy treatment. This type of treatment can either be directed at cervical spine dysfunctions, temporomandibular disorders, or both and consists of a combination of counselling, exercises, and manual techniques to restore normal function of the cervical spine and temporomandibular area. Other techniques have been suggested but often need further investigation in larger RCTs. This lecture will give an overview of current knowledge on ST diagnosis and treatment options.

The "missing" relationship between OAEs and tinnitus

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Back in 1990, Susan Norton described the tinnitus + OAE relationship as follows "Attempts to identify the mechanisms underlying tinnitus and to develop effective treatments have been frustrating, in part because there are no objective measures of tinnitus. Following Kemp's initial reports of evoked and spontaneous otoacoustic emissions (OAEs), many people hoped that OAEs were an objective correlate of tinnitus." Thirty-five years later, the relationship between OAEs and tinnitus remains as phantomatic as it was in the early 90s. The actual problem stems from two main causes: (1) the difficulty of identifying correctly the genesis mechanism of tinnitus and its location in the auditory pathway, per studied case; (2) The spontaneous otoacoustic emissions (SOAEs), which are primarily considered in this relationship are difficult to record efficiently in the second, third, fourth decade of life. This in-depth review presents old and modern data, representing both sides of the coin (there is and there isn't a relationship) of this continuing argument.

Translating non-invasive brain stimulation into a treatment for tinnitus

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Introduction: Neuromodulation therapies aim to interfere with abnormal neural activity and drive neuroplastic changes. Non-invasive brain stimulation aims to interrupt neuronal activity associated with tinnitus and restore typical levels of activity. This change in activity should alter or interrupt tinnitus percept. Neuromodulation therapies use electromagnetic, electrical, acoustic and more recently ultrasound stimulation. However, precise neuronal mechanisms of those interventions are not fully understood, and evidence of their effectiveness is limited.

Material and methods: A comprehensive research programme at NIHR Nottingham Biomedical Research Centre aims to identify the most promising non-invasive therapies for tinnitus, optimise the stimulation protocols and conduct trials of those interventions in participants with tinnitus. Two systematic reviews have been conducted looking at effectiveness of neuromodulation therapies and optimal stimulation protocols. We used magnetoencephalography (MEG) to investigate changes in the brain activity of people with tinnitus while undergoing transcranial direct current stimulation (tDCS) and are currently conducting a pilot study of multiple sessions of tDCS for tinnitus. A current modelling study explored the inter individual variability in current reaching the bran during the tDCS stimulation and the feasibility of individualised dose-controlled stimulation in people with tinnitus. Our new strand of work is assessing

safety and feasibility of ultrasound vagal nerve stimulation (U-VNS) for tinnitus.

Results: Systematic reviews identified tDCS as the most promising non-invasive brain stimulation method for the treatment of tinnitus and co-morbid symptoms. A set of optimal stimulation parameters has been established and the trial protocol formulated. MEG revealed that tDCS stimulation induced oscillatory changes in some frequency bands that could be localised to the frontal or temporal regions and at the whole brain level. Anatomical differences between participants affected the level of the current reaching the brain, indicating the potential need for individualised stimulation protocols. New methods, such as U-VNS open new avenues for non-invasive treatments for tinnitus.

Conclusions: This research programme is an important step towards developing safe and minimally invasive treatment for tinnitus. It provides insight into tinnitus mechanisms and treatment-related changes and informs the design of the future trials of non-invasive brain stimulation for tinnitus.

Treating tinnitus with electrical stimulation

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Introduction: Tinnitus is the perception of sound without an external source and can severely impair individuals. Currently, no pharmacological treatments exist. Our study evaluated the immediate effects of non-invasive electrical stimulation through the ear canal on tinnitus loudness and distress to identify factors influencing the outcomes.

Material and methods: Sixty-six chronic tinnitus patients (29 women, 37 men, mean age 54.4 ± 10.4) were enrolled at a tertiary hospital from December 2019 to December 2021. They received 10 minutes of stimulation through the ear canal over three days. Loudness and distress were assessed using visual analog scales before and after stimulation.

Results: After three days, loudness decreased in 47% of patients; 45.5% had no change, and 7.6% reported worsening. Tinnitus severity improved in 36.4%, while 59.1% had no change, and 4.5% worsened. Women responded positively to therapy sooner than men. Notably, patients with compensated tinnitus showed reduced distress, unlike those with uncompensated tinnitus. Those with bilateral tinnitus improved earlier than unilateral cases, and age did not affect outcomes.

Conclusions: This study suggests that non-invasive electrical stimulation may be a promising strategy for identifying patients suited for advanced therapies like extracochlear anti-tinnitus implants, significantly impacting tinnitus management and patient care.

Oral Presentations

An experimental study on optimal bone cement thickness for passive acoustic reduction for pulsatile tinnitus

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Objective: To determine the ideal bone cement thickness for optimal passive sound reduction in pulsatile tinnitus (PT) and to minimize surgical invasiveness when resurfacing sigmoid sinus wall anomalies (SSWA).

Material and methods: An acoustical impedance tube was used to measure the transmission loss of bone cement discs (15 mm in diameter), which were trimmed to various thicknesses (2.5, 5.0, 7.5, 10.0, 12.5, 15.0 mm) and averaged over three trials. Additionally, PT loudness in 18 subjects with SSWA was measured using the EAC-R technique and spectrotemporal analysis.

Results: At a thickness of 2.5 mm, transmission loss was less than 10 dB for frequencies above 180 Hz. Thicknesses of 5.0 mm and 7.5 mm achieved transmission losses of over 15 dB across all frequency ranges. When the bone cement thickness reached 10 mm or more, transmission loss at frequencies below 500 Hz was at least 35 dB. The average PT loudness measured was 4.7 dB.

Conclusions: A bone cement thickness of less than 5.0 mm may indicate a risk of surgical failure. A thickness greater than 5.0 mm, along with complete resurfacing of all dehiscences, is recommended to effectively prevent PT.

Coping strategies among tinnitus patients in Malaysia: an early phase approach

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Introduction: Tinnitus is a condition where patients will hear sounds without an external stimulus. A large part of the adult population experiences this symptom but never seeks professional help, while others have devastating complaints in daily life. To some extent, it can cause stress, attention breakdown, and psychological distress. This suggests that the impact of tinnitus varies among patients and may be influenced by coping strategies and multiple psychological factors.

Material and methods: This study attempts to understand how patients cope with tinnitus prior to seeking professional help. Cross-sectional study of patients visiting the tertiary tinnitus referral center in hospitals under the Malaysia Ministry of Health (KKM). 12 centers were involved, and data was obtained from a total of 56 patients from January 2024 till June 2024. The interview focus is on obtaining the information on early responses of patients toward tinnitus prior to seeking a professional or audiologist's help.

Result: The finding showed most of the patients did not know what to do and hoped tinnitus would disappear by itself (65%), applied relaxation activities (21%), sought a doctor's treatment (57%) and found information about tinnitus in social media (16%). This finding will help a clinician with in-depth knowledge related to the management of tinnitus. This data showed the importance of awareness regarding tinnitus needs to be improved.

Conclusions: The majority of patients in the early stage/phase of tinnitus are unclear about how to overcome it. This study also suggested that information related to tinnitus in the Malaysian population is low. Tinnitus-related awareness programs need to be improved and expanded.

Development of an innovative app for the diagnosis and treatment of tinnitus using sound therapy and nutritional supplements

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Tinnitus is a prevalent hearing condition characterized by the perception of ringing in the ears, significantly affecting the quality of life of individuals. In response to this clinical need, we have developed an advanced mobile app that facilitates both the diagnosis and treatment of tinnitus. Using artificial intelligence algorithms, the app accurately diagnoses the level and nature of tinnitus according to tone, intensity, frequency and its impact on the quality of life through a series of interactive hearing tests and personalized questionnaires. Once diagnosed, the user is guided through a comprehensive treatment plan that combines sound therapy and nutritional supplements. Sound therapy employs a library of therapeutic sounds that can be customized to mask tinnitus and promote habituation. In addition, the app suggests specific nutritional supplements based on scientific evidence supporting their efficacy in mitigating tinnitus. Users can track their progress through the app, adjust their treatments as needed, and access additional educational resources. This app represents a significant advancement in tinnitus self-management, offering a holistic and accessible approach to improving hearing wellbeing. Results: Participants who achieved masking with their hearing aids had a greater reduction in THI-TQ-VAS scores. Masking was more likely to be achieved when participants had good low-frequency hearing and the tinnitus pitch fell within the hearing aid frequency range. Conclusions: The results support that the use of hearing aids with masking and counseling for tinnitus management may be a significant contributor to hearing aid success, implying that high-frequency amplification may be effective in acute tinnitus.

Development of an unguided digital intervention for hyperacusis: internet Self-Help, Understanding and Support for Hyperacusis (iSHUSH)

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Introduction: Hyperacusis, a reduced tolerance to sounds, can be complicated and challenging to live with. People can become distressed, anxious, and often isolated. These problems are exacerbated by the lack of information and knowledge of appropriate coping strategies. Digital health interventions provide an important platform to improve accessibility to education, support, and coping strategies for hyperacusis, and offer an alternative option for those unable or unwilling to attend clinics.

Aim: The aim of this project was to develop an unguided educational, self-help website for hyperacusis.

Material and methods: Intervention planning included qualitative interviews to identify patients and healthcare professional's (HCPs) experiences, needs and challenges of hyperacusis, and a meta-ethnography review to identify barriers and facilitators to engaging with digital interventions. Evidence was triangulated with expert consultation to inform the interventions guiding principles and logic model. The intervention was optimised through think-aloud interviews with patients and HCPs, and named the internet Self-Help, Understanding and Support for Hyperacusis (iSHUSH).

Results: Key hyperacusis-related challenges highlighted during development of the website included the use of safety behaviors (e.g. avoidance), uncertainty of risks associated with ear protection, and difficulties managing emotions. Considerations for the intervention design included a need to legitimise the hyperacusis experience, increase confidence in engaging with different sound environments and setting goals, and recognising that some intervention content might only be relevant to some people who have hyperacusis. Feedback informed intervention modifications to maximise acceptability.

Conclusions: Our systematic approach to intervention development enabled us to understand the experiences of adults with hyperacusis, target the key challenges/behaviors, and anticipate potential barriers to engagement during development. Through this, we have developed an unguided digital intervention for hyperacusis that appears to be acceptable and potentially engaging to our intended users. The next stage of this research will be to test the acceptability and feasibility of the iSHUSH with intended user and HCPs.

Effectiveness of hearing aids, masking and counselling for tinnitus therapy in sudden sensorineural hearing loss

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Introduction: Tinnitus is a common symptom of sudden sensorineural hearing loss (ISSHL).

Objective: This study aimed to investigate the characteristics and outcomes of acute tinnitus in patients with ISSHL.

Material and methods: To assess the benefits of amplifying hearing aids and tinnitus masking using the Tinnitus Reaction Questionnaire (TQ), Tinnitus Handicap Inventory (THI) and Visual Analogue Scale (VAS) in combination with counselling, to assess whether the degree of masking with hearing aid amplification influenced test scores, to examine whether matched tinnitus pitch predicted the effectiveness of hearing aids in masking tinnitus, and to determine whether prescription of amplification might be desirable in the management of tinnitus when tinnitus pitch is loud. A retrospective evaluation of the clinical outcomes of 185 tinnitus patients fitted with hearing aids was undertaken. The primary outcome measure was the TQ-THIR VAS, with a secondary subjective measure of tinnitus masking.

Efficacy and safety of pharmacological treatment in tinnitus patients

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Introduction: The problem of tinnitus is an important health problem for patients suffering from this disease. Currently, there are no drugs approved by the FDA or EMA for the treatment of tinnitus of various etiologies.

Aim: The aim of the study is to review currently used pharmacological treatment strategies for tinnitus in terms of their effectiveness and safety.

Material and methods: A review study based on the analysis of results from randomized clinical trials (RTC) assessing the effectiveness and safety of tinnitus treatment. The drugs analyzed include: antidepressants (e.g. amitriptyline), melatonin, steroids (dexamethasone), acamprosate, nicergoline, vinpocetine, piracetam, memotropil, ginkgo biloba betahistine, pentoxifylline, anticonvulsants (e.g. gabapentin). The effect of supplementation was also analyzed (e.g. vitamin C, zinc, B vitamins, selenium).

Results: As a result of the analysis, drugs with the highest effectiveness and safety were selected. For example, very good results in patients with no clear etiology of tinnitus were achieved when using antidepressants (amitriptyline), antiepileptic drugs (gabapentin) or a topically applied steroid (dexamethasone) with the simultaneous use of oral melatonim (according to the clinical trilas).

Conclusions: It is still recommended to conduct new clinical trials in the area of drugs and tinnitus. The choice of drug treatment depends on the causes of tinnitus.

Electrophysiological exams and tinnitus

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Tinnitus, the perception of sound without external auditory stimulus can be a devastating disorder. Despite many advances in our understanding of tinnitus, there are limited options for effective treatments and objective diagnostic tests to check the neurotransmitters involved in the cause of tinnitus. When it comes to the symptom of tinnitus, we have the involvement of the auditory pathways and the neurotransmitters present in each area, which can exert inhibitory and/or excitatory effects on different areas in the same system.

The need for an objective examination of tinnitus is increasingly necessary so that we can identify the neurotransmitters that are out of balance in the auditory system so that we can reduce the difficulty in diagnosing and treating tinnitus. I will show that a noninvasive electrophysiological measure can help direct the etiological diagnosis and treatment of tinnitus. An objective examination is desperately needed to elucidate tinnitus.

Embracing teleaudiology for tinnitus management: preliminary insights from Malaysian audiologists and tinnitus patients

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Introduction: Teleaudiology for tinnitus management has yet to be extensively explored in Malaysia, highlighting the need for preliminary insights from key users, particularly audiologists and patients with tinnitus.

Objective: This study aimed to evaluate the acceptance of teleaudiology for tinnitus management among audiologists and patients with tinnitus in Malaysia.

Material and methods: A cross-sectional study was conducted using the validated and reliable MyTUQ-T to assess the acceptance of teleaudiology for tinnitus management among 42 audiologists (mean age: 36.71 ± 4.74) and 84 patients with tinnitus (mean age: 46.04 ± 14.52) across Malaysia.

Results: Both audiologists and patients with tinnitus demonstrated a tendency to accept teleaudiology for tinnitus management in Malaysia. The "Usefulness" subscale achieved the highest average score, while the "Reliability" subscale recorded the lowest score in both groups.

Conclusions: Although there is still a gap in the full acceptance of teleaudiology for tinnitus management, the findings indicate that both audiologists and patients are moving closer to accepting its use. This initial insight lays a crucial foundation for the integration of teleaudiology into tinnitus management in Malaysia.

How to manage tinnitus – a personal experience from Jordan

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Aim: Tinnitus, a prevalent auditory condition characterized by the perception of sound without an external source, presents significant diagnostic and therapeutic challenges. This presentation explores my clinical experience in my clinic in Jordan, focusing on the evaluation and management of tinnitus with an emphasis on tinnitus matching.

Material and methods: Retrospective chart review for patients visited the clinic mainly for tinnitus over the last 4 years.

Results: More than 300 cases were reviewed. We have encountered diverse cases, ranging from mild to severe, often linked to hearing loss, noise exposure, or underlying medical conditions. Tinnitus matching has proven to be a crucial step in the diagnostic process, allowing for precise characterization of pitch and loudness, which informs personalized treatment strategies.

Conclusions: In my practice, I have found that accurate tinnitus matching enhances patient understanding and facilitates targeted interventions, including counselling, sound therapy, and hearing aid adjustments. The use of standardized audiological techniques and patient-centered approaches has significantly improved outcomes. Challenges such as patient subjectivity, variability in response, and limited local awareness remain obstacles in tinnitus management in Jordan.

Intracranial dural arteriovenous fistula can mimic sigmoid sinus wall anomalies induced pulsatile tinnitus

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Objective: (1) To highlight that dural arteriovenous fistula (DAVF) can exist in subjects with unilateral vascular pulsatile tinnitus (PT), positive internal jugular vein (IJV) compression tests, and radiologic evidence of sigmoid sinus wall anomalies (SSWA). (2) To introduce the "moth-eaten sigmoid plate" sign and emphasize the importance of retroauricular compression in diagnosing PT.

Material and methods: Retrospective data analysis on 81 subjects with PT as sole symptom and intracranial DAVF was studied using high-resolution temporal bone CT and magnetic resonance angiography (MRA). The moth-eaten sigmoid plate sign and DAVF-induced SSWA were defined, and their correlation with PT duration was studied.

Results: Significant differences were observed between ipsilateral IJV and retroauricular compression outcomes in DAVFs located at the transverse-sigmoid sinus ($p < 0.01$) and hypoglossal canal ($p < 0.01$). Among 71 subjects with CT data, the moth-eaten sign was found in 29 of 37 subjects (78.4%) with DAVFs at the transverse-sigmoid sinus. SSWA and JB anomalies were observed in 40.8% of subjects. PT duration significantly differed between subjects with SSWA and those without SSWA ($p < 0.01$).

Conclusions: The presence of SSWA on CT and a positive IJV compression test should not be considered conclusive for diagnosing venous PT. The "moth-eaten sigmoid plate" sign on non-contrast CT and positive retroauricular compression are strong indicators of DAVF as the primary cause of PT.

Investigation of the effects of long-term binaural beats application on tinnitus patients

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Introduction: Binaural beats (BB) are one of the neuromodulation methods that have recently come to the fore in the treatment of tinnitus. The effects of long-term use of this method, which basically uses the auditory entrainment mechanism, are controversial.

Aim: This study aimed to evaluate whether a 6-week theta-band BB intervention, in which neural plasticity can be achieved, would lead to improvements in tinnitus discomfort and associated depression scores in individuals.

Material and methods: A total of 52 people with tinnitus participated in this study, but 18 patients completed theta band BB for 6 weeks. 18 patients applied theta band BB for 20 minutes a day for a period of 6 weeks. Tinnitus Handicap Inventory (THI), 10-point VAS scale for tinnitus discomfort rating and Beck Depression Inventory (BDI) were used to evaluate the depression scores of the participants before and after the BB application. Pre and post-test scores were compared to determine the effectiveness of the intervention. Paired samples *t*-test was used in the pre-post evaluation of THI and BDI.

Results: Before the 6-week theta band BB application, the THI score, which was at the level of moderate handicap with an average of 52.7 points, decreased to the level of mild handicap with 34.3 points after the application ($p = 0.004$). Also, the level of discomfort from tinnitus decreased from 6.7 to 4.0 points ($p < 0.001$). We observed that patients with mild depression with an average of 10.8 points before the application decreased to normal depression level with 5.3 points after the application ($p = 0.007$).

Conclusions: The results of our study showed that theta-band BB applied for 6 weeks can provide significant improvements in tinnitus discomfort and depression symptoms, and that this method can be effective especially in individuals with moderate tinnitus. The fact that depression levels associated with tinnitus decreased after theta-band BB application indicates that this treatment method also contributes to psychological improvements. These results suggest that theta-band BB, a non-invasive intervention, may be a clinically effective option for the treatment of tinnitus. However, more comprehensive studies examining its long-term effects and its effects on neuroplasticity are needed.

Microscopic and endoscopic transtemporal surgical techniques for effective resolution of venous pulsatile tinnitus: insights from a 253-case surgical series

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Objective: To provide insights into the curative effects and identify reasons for surgical failure in subjects with recurrent venous pulsatile tinnitus (PT) caused by sigmoid sinus wall anomalies (SSWA).

Material and methods: This study is a retrospective data analysis of 253 subjects diagnosed with venous PT due to SSWA who underwent transtemporal resurfacing surgery. Among these subjects, we compared the curative effects between those who underwent extraluminal compression of the sigmoid sinus wall and those who did not. Additionally, new surgical techniques were applied to address venous PT caused by oblique occipital sinus, sylvian vein alongside tegmen dehiscence, and transverse sinus stenosis.

Results: Among the 230 cases followed up, PT was resolved in 208 cases (90%). In the 22 cases where PT recurred, the most common finding was incomplete resurfacing of the dehiscence, observed in 17 subjects with recurrent PT. There was no statistical significance between extraluminal compression and mere resurfacing of the dehiscence. PT and papilledema in two subjects with concomitant idiopathic intracranial hypertension (IIH) were resolved and reversed following dehiscence resurfacing and transtemporal transverse sinus decompression surgery. The transverse sinus lumen experienced its largest area expansion, increasing by approximately 31.2%. However, two subjects experienced tympanic membrane perforation following jugular bulb reconstruction using excessive bone cement.

Conclusions: The primary cause of recurrent PT is incomplete resurfacing of the dehiscence. PT can be eliminated without reducing a diverticulum; resurfacing its dehiscent surface is sufficient.

Pharmacological treatment of tinnitus

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For many patients and health care providers, one of the most desirable tinnitus treatment should be a sort of "magic pill", capable of providing relief for the majority of patients. Although many attempts have been made to find such a pill, we are still too far away, and, in fact, probably never will be able to discover it, being that tinnitus is a multi-factorial symptom, requiring distinct, individualized treatment strategies. Treatment should be, at first, directed at the cause of tinnitus, if a cause may be ruled. These causes include

metabolic and cardiovascular disease treatments, tumor resections, nois-induced hearing loss, etc. If a cause cannot be determined or if the cause is no longer present (tinnitus as a sequela) then treatment of the sequel (tinnitus, in this case) should be pursued. Pharmacological treatment is one of the possibilities, albeit, controversial. Many drug trials have succeeded in alleviating tinnitus but failed to be replicated. As yet, no drug is approved by the FDA to treat tinnitus, but, on the other hand, some studies cited pharmacological treatment as the most frequent to eliminate tinnitus. On this lecture, the speaker will provide a quick summary of the drugs available to treat tinnitus, based on his experience supported by many controlled trials, and also present a tentative guideline based on the subtyping of tinnitus.

Polish results of tinnitus therapy using bimodal stimulation with the Lenire device in patients with tinnitus

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Introduction: Tinnitus is defined as the perception of sound without an external acoustic stimulus. Currently, there is no single effective treatment method for tinnitus that works for all patients. One of the newer approaches is bimodal stimulation, which combines acoustic stimulation with somatosensory pathway stimulation. The goal of therapy is to reduce the severity of tinnitus and improve the quality of life for patients suffering from tinnitus.

Objective: The aim of this study was to evaluate the effectiveness of bimodal stimulation using the Lenire device in reducing tinnitus severity in 30 patients.

Material and methods: The authors present the results of their own research on the use of bimodal stimulation therapy in 30 patients with tinnitus. The results of the Tinnitus Handicap Inventory (THI) questionnaire were analyzed.

Results: The results of the authors own research on the use of bimodal stimulation with the Lenire device showed an effectiveness of 76%. After the first follow-up visit, 66% of patients reported improvement, with an average decrease in THI score of 16.6 points. After the second follow-up visit, 76% of patients reported improvement, with an average decrease in THI score of 20.9 points.

Conclusions: Bimodal stimulation using the Lenire device may be an effective treatment method for patients with tinnitus.

Relationship between trait mindfulness and tinnitus severity: evidence from a clinical sample

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Aim: Mindfulness is paying attention in a particular way: on purpose, in the present moment, and nonjudgmentally. Due to bringing attention to bodily sensations, thoughts and feelings, it supports developing greater interoceptive awareness, emotion regulation and reduces stress sensitivity. The study aims was to determine whether there was a relationship between the mindfulness trait and perceived tinnitus severity. The research hypothesis was that such a relationship exists and is negative in nature, i.e. the high level of mindfulness trait is accompanied by the low level of tinnitus severity.

Material and methods: The study group consisted of 99 patients with chronic tinnitus. There were 54 women and 45 men. They were aged between 19 and 79 years ($M = 52.7$; $SD = 13.4$; women: $M = 44.9$; $SD = 12.8$). The audiological examination included pure-tone audiometry and measuring the pitch and loudness of tinnitus. The Five Facet Mindfulness Questionnaire (FFMQ), Tinnitus Handicap Inventory (THI), and Skarzynski Tinnitus Scale (STS) were used.

Results: There was a significant and positive correlation between trait mindfulness and tinnitus severity. Patients with higher level of acting with awareness had lower tinnitus severity ($r = -0.34$; $p = 0.001$). Also greater nonreactivity to inner experience was associated with lower tinnitus severity (rho = –0.27; $p = 0.007$). Acting with awareness was a significant and negative predictor of tinnitus severity ($\beta = -0.26$; $p = 0.020$).

Conclusions: The study confirms a significant negative relationship between trait mindfulness and perceived tinnitus severity. These findings suggest that trait mindfulness may be a valuable psychological resource in managing tinnitus and reducing its subjective impact.

Revealing the struggle for silence: highlighting the mental health crisis in people living with tinnitus

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Introduction & objectives: Tinnitus – the perception of sound when there is no corresponding external sound – affects around one in seven adults in the UK. Tinnitus UK wished to examine the experiences of people living with

tinnitus, including accessing healthcare support for the condition.

Material and methods: In December 2023 Tinnitus UK members, mailing list subscribers and social media followers were invited to answer questions about their tinnitus, its impact and the support received in primary and secondary care. 478 people completed an online survey.

Results: Patient experiences – symptoms varied across the respondents, but the impact of tinnitus on quality of life and mental health could be severe.
- over 1 in 5 of respondents had had thoughts of suicide or harming themselves in the last year;
- more than 8 out of 10 respondents experienced low mood or anxiety in the last year, with 7 out of 10 feeling hopeless or helpless;
- sleep disturbances affect 85.7% of respondents;
- the emotional impact of tinnitus is significant, with 68.4% reporting low self-esteem and 54.9% struggling to think rationally.

Healthcare support:
- half of respondents obtained GP appointments within a week, but 16% waited over a month;
- referrals to secondary care decreased to 57.9% (2020: 64%) with 11.7% not offered a referral;
- the number of people reporting that they waited more than 12 months for an appointment in secondary care has tripled from 2019 to 2023, with 1 in 6 facing waits of more than a year;
- the increase in waiting times for audiology appointments impacted quality of life for two thirds of respondents;
- there is limited mental health support from GPs;
- only 5% of respondents were offered cognitive behavioural therapy (CBT) as recommended in the NICE guidelines for tinnitus.

Conclusions: The survey starkly revealed the substantial toll tinnitus can take on mental health, emphasising the urgent need for comprehensive support and intervention measures to address the psychological challenges associated with this condition. The findings underscore the imperative for enhancements in the initial stages of tinnitus care, including timely access to appointments, improved reassurance, increased dissemination of information by healthcare professionals and increased access to psychological support.

Sigmoid sinus wall anomalies can progress and may not be congenital

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Objective: Sigmoid sinus wall anomalies (SSWA) are closely linked to venous pulsatile tinnitus (PT). This study aims to demonstrate that SSWA develops progressively rather than being congenital.

Material and methods: We retrospectively analyzed 42 PT patients with SSWA who had at least two non-operative CT scans at our clinic. CT images were longitudinally assessed to track SSWA progression, while MRI and Doppler ultrasound evaluated transverse sinus stenosis and venous hemodynamics. Changes in PT perception were tracked using the tinnitus handicap inventory (THI) questionnaire.

Results: Among the 42 SSWA patients, 12 (28.6%) exhibited progression. Anastomosis between diploic vein and diverticulum was significantly higher compared to the dehiscence cohort ($p < 0.01$). Within the diverticulum group, seven individuals (30.4%) experienced enlargement, with a mean diverticular wall expansion of 5.9% ± 11.4%. Progressive erosion was observed in two cases (12.5%) in the dehiscence cohort, with a mean sigmoid plate erosion of 3.8% ± 10.1%. In cases progressing from dehiscence to diverticulum, three subjects transitioned, with a mean sigmoid sinus wall length expansion of 43.8% ± 31.9%. SSWA progression showed a significant negative correlation with QBILATERAL ($r = –0.857$, $p = 0.014$), and there was a significant difference between initial and revisit THI scores ($p < 0.01$).

Conclusions: SSWA can undergo morphological progression, indicating it is a progressive clinical condition rather than congenital.

Sleep intermittent tinnitus patients exhibit infradian circasemiseptan tinnitus loudness periodicity

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Introduction: A subpopulation of tinnitus patients experiences complete intermittence of their tinnitus in relation to sleep. On some days, they report perceiving higher tinnitus loudness immediately after waking, which persists throughout the day. On other days, they wake up without tinnitus and may remain tinnitus-free until the next sleep episode, unless they take a nap. To date, and to our knowledge, no study has attempted to determine whether such alternations are purely random or periodical.

Material and methods: 17 tinnitus patients exhibiting this symptomatology were prospectively recruited and reported daily tinnitus loudness and sleep diary for two months through an online questionnaire. Lomb-Scargle periodogram was used to determine whether periodic oscillations in their tinnitus were present. A confirmatory analysis was conducted on a retrospective database of 1851 patients, from which were extracted a test group ($N = 17$) and two control groups ($N = 17$ and $N = 22$). Additionally, tinnitus intensities in relation to sleep durations were analyzed.

Results: A periodicity between 2.5 and 4.5 days was significantly present in the prospective sample and in the test group of the retrospective sample ($p < 0.001$). Tinnitus loudness absolute variations were more important during the night than the day without naps ($p < 0.001$).

Conclusions: The alternation between the presence and absence of tinnitus in this subpopulation does not appear to be random. While it is evident that sleep plays a precipitating role in the loudness transitions of tinnitus reported by this subpopulation, the observed infradian rhythmicity suggests an underlying endogenous physiological phenomenon such as sleep pressure or sleep debt.

Spontaneous otoacoustic emission as a novel method to screen pulsatile tinnitus caused by sigmoid sinus wall abnormalities: a prospective study

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Objective: To evaluate the diagnostic potential of spontaneous otoacoustic emissions (SOAE), distortion product otoacoustic emissions (DPOAE), and pure-tone audiometry (PTA) in patients with pulsatile tinnitus (PT) caused by sigmoid sinus wall anomalies (SSWA).

Material and methods: This study included 20 PT patients and 20 matched healthy controls. SOAE, DPOAE, and PTA were assessed before and after compression of the internal jugular vein. Statistical analysis included paired t-tests to compare differences in SOAE amplitude, DPOAE signal-to-noise ratios, and PTA thresholds, while independent t-tests assessed age differences, and one-way ANOVA evaluated mean PTA thresholds.

Results: SOAE amplitudes were significantly higher in ipsilesional ears compared to contralesional and control ears. DPOAE showed a significant difference in 0.5 kHz S/N-ratio between ipsilesional and contralesional ears. PTA revealed higher thresholds in ipsilesional ears at low frequencies, with differences decreasing after compression.

Conclusions: Besides radiological modalities, SOAE is a sensitive tool for diagnosing and assessing the severity of PT in patients with SSWA, with DPOAE and PTA providing supplementary information. These findings suggest a multimodal approach for the diagnosis of PT related to SSWA.

Tinnitus in patients with nasal obstruction – preliminary results

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Introduction: One of the causes of tinnitus is Eustachian tube dysfunction (ETD). The etiology of ETD is multifactorial, and can be caused by, among other things, swelling and inflammation, observed in patients with nasal obstruction due to chronic sinusitis or deviation of the nasal septum.

Aim: The purpose of this study was to evaluate the prevalence of tinnitus in patients requiring surgery to improve nasal passage and the effect of the presence of ETD on the presence of tinnitus.

Material and methods: 37 patients of the Institute of Physiology and Pathology of Hearing who presented for surgical treatment for nasal obstruction were recruited for the study. Prior to surgery, patients completed the Eustachian Tube Dysfunction Questionnaire (ETDQ-7) and were also asked about the presence of tinnitus. An Eustachian Tube Function Test (ETF) test was then performed. Patients with abnormal ETFs were classified into the study group, while the others were classified into the control group.

Results: Among the patients participating in the study, an abnormal ETF score was observed in 23 (62.2%), while an abnormal ETDQ-7 score was observed in 13 (35.1%). Tinnitus was more common in patients with ETD (60.9% in the study group, 28.6% in the control group). Tinnitus was also more common in patients with abnormal ETDQ-7 score (76.9% versus 37.5% of patients with normal ETDQ-7).

Conclusions: Preliminary results suggest that nasal patency disorders may indirectly influence the occurrence of tinnitus in patients by inducing ETD. Further analysis is needed, and further recruitment of patients for the study and comparison of preoperative and postoperative results are planned.

Tinnitus severity assessment in cerebellopontine angle tumors before and after treatment

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Introduction: The most common initial symptom of cerebellopontine angle tumors is unilateral tinnitus. This condition

should always be a signal to initiate diagnostic evaluation of central nervous system (CNS) abnormalities, particularly to exclude the presence of a cerebellopontine angle tumor. Patients with such tumors often experience prolonged symptoms, primarily due to unilateral tinnitus, which can be challenging to treat. The aim of the study was to assess the severity of tinnitus in patients with cerebellopontine angle tumors before and after treatment.

Material and methods: The study group consisted of 95 patients diagnosed with a unilateral cerebellopontine angle tumor, aged between 18 and 86 years, who were treated at the Greater Poland Cancer Center. Most patients, depending on tumor size and the severity of subjective symptoms, were qualified for treatment using the CyberKnife method. After treatment, some patients were fitted with a hearing aid with a noise generator, and its effectiveness was evaluated six months after its implementation. Patients undergoing treatment were assessed based on an analysis of subjective symptoms using a prepared questionnaire before and after treatment. The results were compared before treatment, at least 3–6 months after the initial radiotherapy, and six months after the use of hearing aids.

Results: The vast majority of patients assessed the treatment as effective. A significant improvement in tinnitus severity was reported following CyberKnife therapy. Additionally, patients who received a hearing aid with a sound generator after radiotherapy noted a substantial enhancement in their hearing condition and a reduction in tinnitus symptoms.

Conclusions: CyberKnife therapy proved to be an effective treatment for reducing tinnitus severity in patients with cerebellopontine angle tumors. The addition of hearing aids with sound generators further contributed to symptom relief and auditory improvement, highlighting the benefits of a combined therapeutic approach for managing tinnitus in these patients.

Trends in the advancement of mobile applications for the diagnosis and treatment of tinnitus – a look to the future

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Introduction: Audiological aliments like tinnitus require multidisciplinary care. Therapy for tinnitus should be available on a daily basis because of its troublesomeness in everyday functioning. To meet this challenge, specialists are looking for solutions in increasingly common access to the Internet and increasingly widespread use of mobile devices. Furthermore, smartphones have an application ecosystem that can be extended by new apps programmed for a particular health problem.

Aim: Assessment of the scale and direction of creating and using mobile applications to diagnose and treat tinnitus.

Material and methods: Google Scholar, PubMed, ReserchGate published in the period 2010–2023 were searched. The search strategy used the following keywords: "mobile/smartphone apps-tinnitus-identification-analysis-evaluation", „mobile/smartphone apps-tinnitus-diagnosis", „mobile/smartphone apps-tinnitus-self management", „mobile/smartphone apps-device-tinnitus-therapy-treatment, „mobile/smartphone apps-tinnitus-digital technologies", „mobile health-mental health-CBT". The results of the review were catalogued and organized into themes.

Results: Results were organized into the following themes: (1) ranking evaluation and analysis of applications supporting tinnitus therapy existing in the Internet space, (2) mobile applications supporting the diagnosis of tinnitus, (3) applications supporting the therapy of tinnitus (4) a look to the future – the use of sensors, the use of artificial intelligence (AI), big data technology, just-in-time interventions.

Conclusions: Smartphone-based applications with EMAs (ecological momentary assessments), sensors, possibility of using different wearable diagnostic devices can be helpful in better understanding the tinnitus variability and its causes. Combining the mobile applications with a mobile crowd sensing, central database and the support of AI techniques is a valuable source for developing scientific research. Clinically verified methods provided by mobile applications can become a part of the therapeutic process proposed by specialists and enable easy, cost-free and wide range of therapeutic support in dealing with tinnitus. In tinnitus therapy multifunctional smart devices managed by mobile applications such as: smart hearing aids, cochlear implants, hearables may be equally important. The development of mobile technologies and AI techniques will contribute to the creation of smart therapy platforms for tinnitus in the future The platforms could offer personalized prediction models based on a real time assessment with AI support, as well as personalized care with constant, wide availability and just-in-time interventions.

Validation and adaptation of the Arabic version of the Skarzynski Tinnitus Scale

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Purpose: This study aimed to translate the Skarzynski Tinnitus Scale (STS) into Arabic, conduct a cross-cultural adaptation, and validate its psychometric properties.

Material and methods: The translation and cross-cultural adaptation of the STS was carried out in five main steps. 152 participants were divided into two groups: 79 (52%) cases complaining of tinnitus and 73 (48%) in the control group without tinnitus.

Results: The scale required no substantial modifications during the translation process. Cronbach α measured the internal consistency for each of the three subscales and the total

score. The overall psychological distress subscale, Cronbach α was 0.815; for the functional scale α was 0.787; for the coping subscale α was 0.555; and for global STS, α was 0.921. The STS global score and the psychological distress subscale had extremely high consistency.

Conclusions: The translation and adaptation of the STS established linguistic and Arabic cultural equivalence with the original version. Furthermore, the adapted version demonstrated good internal consistency. The results suggest that the STS is suitable for use in a clinical setting.

Why does tinnitus vary with naps? Exploring somatosensory, central and autonomic involvement

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Introduction & objective: Tinnitus, defined as the conscious awareness of a noise without any identifiable corresponding external acoustic source, can be modulated by various factors. Among these factors, tinnitus patients commonly report drastic increases of tinnitus loudness following nap sleep. Previous studies have suggested that this clinical pattern could be induced by covert jaw and neck musculoskeletal modulations, often referred to as somatosensory modulation of tinnitus. To our knowledge, no polysomnographic study has been carried out to assess this hypothesis, nor potential central or autonomic involvement.

Material and methods: For this observational prospective study, 37 participants reporting frequent increases of tinnitus following naps were recruited. They participated to six full-polysomnography nap attempts over two days. Audiological and kinesiologic tests were conducted before and after each nap attempt.

Results: 197 naps were collected. Each nap at each time of day elicited an overall significant increase in tinnitus minimum masking level (MML). Each inter nap period elicited an overall significant decrease. Tinnitus modulations were found significantly correlated with nap sleep duration (Visual numeric scale on tinnitus loudness, VNS-L, $p < 0.05$), with snoring duration (MML, $p < 0.001$), with snoring average sound level (VNS on tinnitus intrusiveness, VNS-I, $p < 0.05$) and with sleep apnea count (VNS-I, $p < 0.001$). MML variations over the nap exhibited significant correlations with Heart rate ($p < 0.01$), theta ($p < 0.001$) and sigma ($p < 0.001$) EEG power bands as well as sleep spindle characteristics such as average duration ($p < 0.001$), frequency ($p < 0.05$) and density ($p < 0.01$).

Conclusions: This study confirms objectively that tinnitus may increase following naps. Several scenarios are compatible to explain the observed correlations highlighted in the present study: nap-induced tinnitus modulations could be covert somatosensory modulations as snoring and sleep apnea events are often related to tensor veli palatini muscle dysfunction or they could be associated with sympathetic and/or central activations. These possibilities will be presented and discussed.

Posters

A noise that comes from inside: cognitive behavior therapy in the treatment of tinnitus

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This work intended to investigate the contribution of cognitive behavior therapy (CBT) in treatment of tinnitus, a symptom that affects around 20% of the world's population. The hypothesis was that CBT would be configured as the main approach in psychology, in reducing symptoms of depression and anxiety, related to tinnitus, improving the quality of life of patients. To respond to the general objective, we try to develop the following specific objectives: a) reflect on the relationships between tinnitus and suffering psychic regarding anxiety and depression; b) characterize the techniques of CBT in reducing the discomfort caused by tinnitus; c) introduce mindfulness as a therapeutic strategy for tinnitus. To this end, the theoretical foundation was anchored in the CBT, in mindfulness studies, in otoneurology and in the literature that deals with tinnitus. As methodology, the choice was for a systematic literature review, through data collection, in specialized electronic databases. The results showed that the literature has confirmed that CBT strategies/techniques contribute to the reduction of symptoms and an improvement in quality of life of patients with tinnitus, who start to live less problem with the symptom. Furthermore, mindfulness, as a therapeutic strategy for tinnitus, was considered beneficial for chronic tinnitus in adult patients, with the finding

that mindfulness brings a significant reduction in the severity, volume and negative impact caused by this symptom.

A novel clinical model for tinnitus: exploring pathophysiology and therapeutic possibilities

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This model provides a framework for understanding and managing tinnitus by integrating biological mechanisms, patient-specific characteristics, and potential therapeutic pathways.

The model identifies four primary domains influencing tinnitus:
– hearing: the auditory system creates the possibility for tinnitus perception;
– attention: dysregulated attention sustains the perception, particularly when attention cannot disengage from the auditory stimulus;
– psychic/emotional: emotional and psychological factors significantly aggravate the condition, often amplifying distress;
– muscular: physical influences, including temporomandibular joint dysfunction (tmj) or bruxism, play a contributory role.

Underlying these domains, personal biology (life history) and personality traits combined with neuroinflammation and potentially unconscious mind involvement (psychological trauma history), with the possibility that autonomic symptoms may also manifest.

This model recognizes that tinnitus rarely exists in isolation. Key associations include:
– dizziness, balance issues, and proprioceptive dysfunction;
– sleep disturbances, such as insomnia or apnea;
– headache and chronic pain syndromes;
– global or auditory attention deficits;
– visual dysfunction.

Severity could be suspected in presence of hyperacusis, depression, obsessive compulsive disorder, general anxiety disorder, personality disorders, chronic pain, unconscious life traumas emphasizing the interaction between mental health, life history and tinnitus long lasting perception.

The model considers exploratory links with:
– diet: Could nutritional habits influence symptom severity?
– gut-brain axis: potential connections between gastrointestinal health and tinnitus, as it has to the brain. Is it possible?
– immunity: Is the immune system a contributing factor, since it is related to emotional status?
– hormonal changes, such as menopause in women, as a neurohormonal disorder.

Triggers virtually can be any life event, most commonly with negative and stressful experiences, exacerbating symptoms.

Implications for treatment: this clinical framework invites a sequential approach to tinnitus management, by identifying the patient's unique physiological and psychological profile, interventions can target specific pathways – whether through auditory therapies, psychological counseling, neuroinflammatory modulation, or lifestyle adjustments. This model advocates for a holistic perspective, combining evidence-based practices with innovative strategies to improve patient outcomes (not only tinnitus distress but also tinnitus volume and pensiveness).

Assessment of the effectiveness of tinnitus treatment using various therapeutic methods

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Introduction: Tinnitus is an auditory phantom perception that occurs in one or both ears in the absence of an acoustic stimulus in the environment. It is "a sensation of sound that results solely from pathological activity within the nervous system, without any corresponding mechanical activity within the cochlea." This condition is a significant social and clinical problem due to its high incidence, lack of a fully effective treatment method and frequent occurrence of emotional problems in patients with tinnitus. Despite many years of intensive research on its etiology, it is still unclear what factor is directly responsible for the perception of noise. This, in turn, results in the lack of an appropriate therapeutic method based on causal action.

Material and methods: The basis for the diagnosis of tinnitus should be a medical interview and appropriate audiological tests (tonal and impedance audiometry) in order to assess the condition of the hearing organ. In special cases, it is also recommended to perform magnetic resonance imaging and ultrasound, computed tomography, magnetic resonance angiography-MRA or conventional angiography.

Results and conclusions: The authors assessed the effectiveness of tinnitus treatment using various therapeutic methods: pharmacotherapy, the use of hearing aids, noise generators, the TRT (Tinnitus Retraining Therapy) method, cognitive-behavioral therapy, vagus nerve stimulation, bimodal stimulation, a prototype device for electromagnetic ear stimulation and mobile applications. The guidelines for the management of patients with tinnitus in clinical practice, published in October 2014 by the American Academy of Otolaryngology and Head and Neck Surgery, include a recommendation against the use of pharmacotherapy in the initial stage of treatment of chronic, bothersome tinnitus. Based on the analyzed scientific works and own research, the newest and most effective methods used in tinnitus therapy include: tVNS vagus nerve stimulation and bimodal stimulation combining auditory and somatosensory stimulation, as well as an innovative method of electromagnetostimulation of the ear using a prototype device of our own design.

Bilateral vestibular insufficiency in a teenager after cochlear implantation and comorbid conditions

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Introduction: Bilateral vestibular hypofunction (VH) is characterized by a pronounced decrease in the function of the vestibular receptors of both labyrinths. Such patients suffer from impaired balance, which worsens in the dark or on a soft, uneven surface, and decreased clarity of vision when moving the head.

Aim: The purpose of our study is a 14-year-old child with severe instability and unsteadiness when walking after meningitis, car accident and cochlear implantation.

Material and methods: The patient, born in 2010, complained of instability and pronounced swaying when walking. From the medical history, 6 months ago he suffered from bacterial meningitis – with severe headaches, persistent fever and coma for 1 week. After the disease, the child developed bilateral sensorineural deafness. A month after being discharged from the hospital, the boy gets into an accident. Only a year later the boy underwent a CI.

Results: The child came to the appointment with the support of his parents. General condition is satisfactory. Romberg's pose is unstable, the torso is deviated in different directions, Romberg's sensitized test is unstable, the Fukuda test is performed slowly, the torso is deviated in different directions. Spontaneous nystagmus – absent. Head shaking test – nystagmus absent. There is no pathological nystagmus on the Dix–Hallpike test. V-HIT – THIEF subdued. LARP 0.20/0.23, RALP 0.23/0.12, lateral channels 0.16/0.26. Severe bilateral hypofunction of the vestibular apparatus. Halmagi test – corrective saccade to the right and left.

Conclusions: These three undesirable pathogenetic factors caused severe bilateral hypofunction in this patient, which is difficult to compensate. Due to the risk of cochlear ossification following meningitis, CI could not be postponed. A triple trigger in the pathogenesis of CH: meningitis, a traffic accident and the post-CI condition led to a condition in the patient that made it difficult even to ride a bicycle. The patient has to undergo not only a course of auditory-speech, but also full-fledged vestibular rehabilitation.

Effects of the COVID-19 pandemic on brain activity in individuals with chronic tinnitus

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This study examined the potential impact of the COVID-19 pandemic on individuals seeking treatment for tinnitus. We compared the performance of tinnitus patients evaluated during the pandemic with those assessed before its onset. The study included 50 adults with chronic tinnitus, divided into a study group (24 individuals tested during the COVID-19 pandemic in 2020–2021) and a control group (26 individuals tested before the pandemic, from 2013 to 2017). None of the study group participants reported having contracted COVID-19. Data collection involved the Tinnitus Handicap Inventory (THI) questionnaire, audiological tests, and quantitative electroencephalography (qEEG). While THI scores did not show statistically significant differences between the groups, qEEG analysis revealed notable changes. Specifically, the study group exhibited significant decreases in alpha and beta band activity, particularly over the auditory cortex, compared to the control group. Our findings suggest that while the COVID-19 pandemic did not significantly affect the perceived severity of tinnitus, it was associated with measurable alterations in brain activity. These results highlight the need for further research to understand the underlying mechanisms and potential long-term effects of these neural changes.

Evaluating the auditory models for predicting speech reception threshold in individuals with tinnitus

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Tinnitus is a phantom auditory perception arising from neural activity without corresponding mechanical activation within the cochlea (Jastreboff, 1995). Tinnitus is frequently associated with hearing loss but can also occur in individuals with clinically normal hearing. Research shows that individuals with tinnitus and normal hearing exhibit higher speech reception thresholds (SRT) compared to those without tinnitus (Niewiarowicz et al., 2022). This presentation explores the effectiveness of two auditory models (Vicente et al., 2020; Lavandier et al., 2022) in predicting SRT for individuals with tinnitus. The model developed by Vincent et al.,

2020, originally designed to estimate SRT in noise for groups of listeners with hearing loss or normal hearing. However, this model do not explicitly account for tinnitus-related factors. The study assesses the models predictive performance for predicting SRT for groups of subjects with and without tinnitus. Preliminary findings suggest that while the Vicente et al. model performs well in predicting SRT for subjects without tinnitus, but its accuracy diminishes when applied to tinnitus subjects, probably due to the lack of model of tinnitus-specific mechanisms. While the Vicente et al. model provides a valuable foundation for SRT prediction, extensions incorporating tinnitus-specific auditory mechanisms and including individual variability between subjects are necessary to improve its accuracy and applicability. The findings will guide efforts to enhance predictive accuracy and support the design of tinnitus maskers that will have the least impact on communication abilities of tinnitus subjects.

Evaluation of factors predicting tinnitus outcomes following cochlear implantation: a prospective quasi-experimental study

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Background and aims: Cochlear implantation is an effective intervention to restore useful aspects of hearing function in adults with severe-to-profound hearing loss. Tinnitus, the perception of sound in the absence of an external source, is common in people with severe-to-profound hearing loss. Existing evidence suggests cochlear implantation may be effective in reducing the negative impact of tinnitus in this population. However, this is contradicted by data suggesting that up to half of cochlear implant recipients experience tinnitus, and that some of these patients who did not have tinnitus before cochlear implantation experience it after surgery or cochlear implant activation. Most evidence on the effects of cochlear implantation on tinnitus comes from secondary data in cochlear implant studies primarily concerned with hearing-related outcomes. Hence, the quality of the evidence for effects on tinnitus is low and not suitable to inform clinical recommendations or decision-making.

Material and methods: Data on tinnitus symptom severity, tinnitus case characteristics, hearing ability, depression, anxiety, insomnia and quality of life will be collected from cochlear implant recipients using the Tinnitus Functional Index (TFI), a tinnitus profiling questionnaire (ESiT-SQ), the Speech, Spatial and Qualities 12 (SSQ-12) Patient Health Questionnaire (PHQ-9), Generalized Anxiety Disorder (GAD-7), Insomnia Severity Index (ISI), Health Utilities Index Mark 3 and EuroQol EQ-5D-5L respectively. Data will be collected before cochlear implantation, 2 weeks after cochlear implantation, immediately after cochlear implant activation, and one, three, and six months post-activation.

Results: An interim analysis on a subset of participants reveals short and long-term changes is tinnitus and related outcomes following implantation.

Conclusions: This study improves our understanding of the effects of cochlear implantation for tinnitus in adults with severe to profound hearing loss and inform the design of clinical trials of cochlear implantation for tinnitus.

Experience with functional near-infrared spectroscopy in patients with tinnitus

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Introduction: Functional near-infrared spectroscopy (fNIRS) is a non-invasive and safe method that allows recording neural activity in the cerebral cortex by measuring the concentration of oxy-, deoxy- and total hemoglobin. Unlike fMRI, it allows studies in motion, with children, in the presence of implants (CI, pacemakers) and is independent of head position.

Material and methods: The study included 14 participants aged 26 to 54 years suffering from tinitus. Functional near-infrared spectroscopy was performed using Cortivision PHOTON CAP equipment. Stimulation scripts were written in Python using PsychoPy software. Stimulation was performed with broadband noise and sound signals at 500 Hz and 6000 Hz, 65 dB. The stimulus was presented for 15 seconds. The pause between stimuli ranged from 30 to 60 seconds at random intervals. A total of 20 presentations were made. Data were analyzed using CortiPrism, Homer3 (Matlab) and AtlasViewer (Matlab).

Results: Functional brain imaging studies in tinnitus showed that it is associated with changes in cortical parts of the auditory pathway, including non-auditory brain regions. This suggests that non-auditory neural connections play a role in the pathogenesis of tinnitus including: frontoparietal area for awareness/attention, temporal cortical lobes.

Conclusions:
1. FNIRS provides distinct advantages in the diagnosis of hearing impairment, subjective tinnitus, and rehabilitation of cochlear implant patients.
2. Despite the current imaging limitations of this method – penetration depth (3 cm) and spatial resolution (1 cm) – fNIRS offers significant advantages with virtually silent recordings that are non-invasive and compatible with cochlear implants in both adults and children.
3. fNIRS overcomes the limitations of other neuroimaging techniques for studying the central auditory system.

Hyperacusis questionnaire – a new tool for assessment of hyperacusis in tinnitus patients

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Introduction: Hyperacusis is a kind of decreased tolerance to sound and is difficult to measure objectively. It often co-occurs with tinnitus. There is a need for valid and reliable patient-reported outcome measures to capture this subjective phenomenon.

Objective: The aim of the study to create a questionnaire capturing hyperacusis in terms of loudness, fear, and pain and then to evaluate its psychometric properties.

Material and methods: The study group consisted of 106 patients, made up of 51 men and 55 women. They were aged between 19 and 72 years, mean 45.2 years (*SD* = 12.4). An initial pool of 33 questions capturing hyperacusis was subjected to expert evaluation and pilot testing. Then, a shortened 19-item version of the tool was checked out. Medical interview, audiological examination and a set of questionnaires: Tinnitus Handicap Inventory, Hyperacusis Questionnaire, State-Trait Anxiety Inventory, and Visual Analogue Scale was completed by all subjects.

Results: The final 14-item Hyperacusis Assessment Questionnaire showed an appropriate three-factor structure that explained 70.5% of the variance. Convergent validity and divergent validity were confirmed by correlations with other measures of hyperacusis, anxiety, tinnitus severity, misophonia, and hearing thresholds. Internal consistency as assessed with Cronbach's alpha was excellent ($\alpha = 0.91$) as was reproducibility (intra-class correlation, ICC = 0.96).

Conclusions: The new Hyperacusis Assessment Questionnaire is a reliable tool that can assess the severity of hyperacusis in terms of loudness, fear, and pain. It can be used in clinical practice and scientific research for patients with hyperacusis and tinnitus.

Magnetoencephalography reveals changes in oscillatory activity and functional connectivity in people with tinnitus undergoing transcranial direct current stimulation

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Background and aims: Transcranial direct current stimulation (tDCS) is a technique involving a low-intensity electric current delivered via electrodes on the head. It is postulated to suppress or enhance neural activity in the region between electrodes. It represents a potential treatment option for tinnitus. Magnetoencephalography (MEG) is a neuroimaging technique that allows for the mapping of brain activity by recording magnetic fields produced by electrical currents occurring naturally in the brain. In this study, MEG was used to investigate changes in the brain activity of people with tinnitus while undergoing tDCS.

Material and methods: 35 participants with tinnitus were randomly assigned to received either real or sham tDCS. Resting state MEG recordings were collected for 10 minutes before, 20 minutes during, and 10 minutes after stimulation. Oscillatory brain activity was assessed at the level of the whole brain and two regions of interest: the frontal cortices – immediately below the electrodes – and the temporal cortices – containing the auditory cortices.

Results: There was no statistically significant change in tinnitus loudness scores after verum tDCS compared to the sham condition. Localised changes in spectral power were observed in: beta and delta bands, and in the gamma band at the level of the whole brain. No changes in functional connectivity were observed.

Conclusions: This study was the first to combine tDCS with MEG in a tinnitus population. Oscillatory changes in some frequency bands could be localised to the frontal or temporal regions. Some observed changes, most notably in the gamma band could only be detected at the whole-brain level. This suggests tDCS can induce changes in oscillatory brain activity in regions not directly affected by tDCS. These changes in activity do not translate to changes in functional connectivity. The design of future studies of tDCS for tinnitus should be informed by these findings.

Microstructural and histopathological analysis of sigmoid sinus plate harvested from pulsatile tinnitus patients with sigmoid sinus wall anomalies using Micro-CT

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Objective: To assess whether bone morphology changes in venous pulsatile tinnitus (PT) subjects with sigmoid sinus wall anomalies (SSWA) are influenced by hemodynamic forces, contributing to the understanding of this condition's development.

Material and methods: A total of 15 subjects was diagnosed with venous PT due to SSWA who underwent transtemporal sigmoid sinus wall surgery. CSF pressure was evaluated in participants using manometry. Sinus hemodynamics were assessed using the Arietta 60 ultrasound system coupling with a continuity equation. Surgically harvested dehiscent/diverticular sigmoid plate specimens were analyzed using micro-CT (μCT) and scanning electron microscope (SEM). Quantitative and qualitative analysis of the correlation between CSFP and μCT outcomes of the harvested sigmoid plate.

Results: Postoperatively, there was a significant reduction in PT intensity in all patients. CSF manometry revealed varying pressures, with a mean of 241.1 mmH_2O. Micro-CT analysis showed significant differences in bone volume and trabecular parameters between harvested sigmoid plate specimens and mastoid controls. Correlation analysis indicated a strong relationship between CSF pressure and trabecular thickness/number. These findings underscore the impact of SSWA on intracranial venous dynamics and the efficacy of surgical reconstruction in alleviating PT.

Conclusions: Our study indicates that SSWA is associated with increased osteometabolism, with μCT revealing higher bone volume and more efficient stress distribution in the sigmoid plate. Elevated CSF pressure may contribute to bone structural changes, and osteoclast activity appears influenced by sinus flow impaction. These findings suggest a complex interplay between hemodynamics and bone metabolism in SSWA pathogenesis.

Preliminary reports on the use of palatal electromyography in the diagnosis of somatosensory tinnitus

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Introduction: The tensor and levator palatine muscles are palatal muscles that influence ear function via the auditory tube. The use of electromyography (EMG) in diagnosing paratubal muscle activity was first reported in 1978. Since then, several studies have suggested that EMG is more effective than endoscopy of the Eustachian tube orifice in assessing the muscular components of movement. However, numerous studies have also shown that Eustachian tube dysfunction is not necessarily related to muscle dysfunction in patients with chronic middle ear conditions or temporomandibular disorders. A PubMed database search using the keywords tinnitus, EMG, and palate identified 15 publications. Few of these studies describe the diagnostic value of palatal EMG in ear disorders. Tinnitus is primarily mentioned as an accompanying symptom of chronic inflammatory ear diseases rather than as the main complaint. Most publications focus on the use of EMG-guided botulinum toxin injections into the palatal muscles for treating tinnitus caused by palatal myoclonus.

Aim: This study aims to present palatal electromyographic findings in patients with unilateral somatosensory tinnitus.

Material and methods: We describe one patient with unilateral tinnitus who was referred for palatal EMG. The patient had undergone a comprehensive audiological evaluation.

Results: EMG recordings from the levator palatini muscles at rest were within normal limits. However, recordings from the tensor palatini muscles were abnormal, indicating tetany. Additionally, asymmetries were observed during effort.

Conclusions: EMG appears to be a promising complementary method for diagnosing somatosensory tinnitus.

Protocol for a randomised controlled pilot study of multiple sessions of transcranial direct current stimulation (tDCS) for tinnitus: the WHITBY study

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Background and aims: Tinnitus – the awareness of sound in the absence of an external source – is a common condition associated with hearing loss, mood disorders, insomnia and reduced quality of life. Current treatment options are limited and do not address the tinnitus percept itself. Transcranial direct current stimulation (tDCS) may be a future treatment option, based on the limited available evidence. This protocol outlines a randomised controlled pilot study which seeks to inform a future clinical trial.

Material and methods: Forty participants will be recruited and randomised to receive ten sessions of either active tDCS or sham over a two-week period. Proof of concept will be measured by protocol compliance and attrition. Tinnitus loudness, tinnitus symptom severity, depression, anxiety, treatment satisfaction, adverse effects and spontaneous and auditory-evoked oscillatory brain activity will be measured using self-report measures and electroencephalography (EEG).

Results: This study seeks to establish the tolerability of multiple sessions of tDCS, devise an evidence-based treatment regimen, pilot the collection of long-term follow-up data and explore the feasibility of individualised head modelling and computational current flow modelling, using MRI, to inform an optimal treatment regimen. The findings will contribute towards the design of a statistically powered randomised sham-controlled trial to determine the efficacy of repeated sessions tDCS to dorsolateral prefrontal cortex (DLPFC) in reducing tinnitus symptom severity.

Conclusions: This study represents an important step towards developing a viable device-based tinnitus treatment that is both safe and minimally invasive. Its results will yield new insights into tinnitus mechanism and treatment-related changes.

Relationship between cognitive fusion and tinnitus severity

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Purpose: Cognitive fusion is a transdiagnostic and important process of psychological inflexibility. That is the tendency to become too entangled in thoughts, beliefs, or judgments that may often leads to rigid thinking and increases psychological distress. The aim of the study is to investigate the relationship between cognitive fusion and tinnitus severity in patients with tinnitus. The research hypothesis was that the high level of cognitive fusion is accompanied by the high level of tinnitus severity.

Material and methods: The study group consisted of 105 patients with tinnitus (57 women and 48 men) aged between 19 and 79 years; mean age was 52.3 years ($SD = 13.3$). The study was conducted in the Tinnitus Department of Institute of Physiology and Pathology of Hearing.

The audiological examination included pure-tone audiometry. Two questionnaires were also used: the Cognitive Fusion Questionnaire (CFQ) and Tinnitus Handicap Inventory (THI).

Results: There was a significant and positive correlation between cognitive fusion and tinnitus severity ($r = 0.36$; $p < 0.001$). This relationship was stronger in men ($r = 0.47$; $p < 0.001$) than in women ($r = 0.26$; $p = 0.053$). While cognitive fusion levels were similar between men and women, tinnitus severity was higher in women than in men.

Conclusions: The results of the study highlight the potential importance of addressing cognitive fusion in the psychological management of tinnitus, particularly in male patients.

The impact of dietary factors on tinnitus: a systematic review

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Introduction: Tinnitus, the subjective perception of sound without an external source, affects a significant portion of the global population. Despite its prevalence and substantial impact on quality of life, the underlying mechanisms of tinnitus remain unclear, and treatment strategies primarily focus on symptom management.

Aim: The objective of this study was to perform a systematic review of all relevant studies investigating the potential role of diet, micro- and macronutrients intake and BMI in risk of developing or reducing existing tinnitus.

Material: This systematic review synthesizes findings from eight studies.

Results: This systematic review synthesizes findings from eight studies investigating the potential link between dietary factors, including macronutrients, micronutrients, antioxidants, and body mass index (BMI), and their role in influencing the risk, onset, and severity of tinnitus symptoms. Findings from the review reveal that high protein intake and low-fat diets are associated with a reduced risk of tinnitus development and alleviating the severity of symptoms. Among micronutrients, vitamins B2, B3, zinc, and iron were linked to prevalence and severity of tinnitus symptoms. Antioxidant supplementation showed promising results, reducing tinnitus loudness and discomfort. Additionally, weight loss interventions were effective in alleviating tinnitus symptoms and improving the quality of life. Results emphasize the role of dietary and lifestyle factors in the prevention and management of tinnitus symptoms.

Conclusions: Incorporating therapeutic dietary interventions, micronutrient, antioxidant intake and weight loss interventions into existing treatment strategies can provide promising results reducing tinnitus and could be comprehensive foundation for further research.

The role of BMI and weight reduction in the prevention and treatment of tinnitus: a literature review

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Introduction: Tinnitus, the subjective perception of sound without an external acoustic stimulus, affects a significant portion of the population, particularly older adults. This condition can significantly impact quality of life, causing sleep disturbances, concentration difficulties, chronic stress, and overall reduced well-being. Increasing amount of evidence points to a potential association between Body Mass Index (BMI), obesity, body composition, and the occurrence and severity of tinnitus.

Aim: The aim of this study was to analyze the available scientific literature and assess the potential relationship between BMI, weight reduction, and the risk of developing or intensity of tinnitus symptoms. Additionally, the study aimed to evaluate the effectiveness of various therapeutic interventions.

Material and methods: This systematic review included nine studies, focusing on the relationships between diet, BMI, weight loss, and tinnitus occurrence. The studies evaluated a range of interventions, including dietary modifications, physical activity programs, and bariatric surgery.

Results: The review revealed a significant association between high body mass index, obesity, and an increased risk of tinnitus, both acute and chronic. Individuals with elevated BMI were found to have significantly higher risks of developing tinnitus compared to those with normal BMI levels. Interventions targeting weight reduction demonstrated notable improvements in tinnitus symptoms. Lifestyle changes such as diet and physical activity led to better outcomes on tools like the Tinnitus Handicap Inventory (THI) and the Visual Analog Scale (VAS), which measure the severity and impact of tinnitus. Bariatric surgery also was identified as an effective strategy, particularly in individuals with severe obesity and pulsatile tinnitus.

Conclusions: Elevated BMI and obesity may be important risk factors for tinnitus. Weight reduction, achieved through lifestyle changes or bariatric surgery, are potentially benefitable in alleviating tinnitus symptoms and improving patients quality of life.

The use of advanced psychoacoustic research methods for the diagnosis of tinnitus

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Introduction: The study, diagnosis and rehabilitation of tinnitus is a very important area of research because tinnitus has a profound negative impact on various aspects of the lives of those affected by this dysfunction, making this problem an important social issue.

Aim: The purpose of this study was to use advanced psychoacoustic testing methods to diagnose tinnitus.

Material and methods: Specialized software was used to determine psychoacoustic parameters, including the frequency of the tinnitus, the sound pressure level of the reference signal at which the subject perceived the same loudness as the tinnitus, and the minimum masking level (MML). Sweeping tone masking thresholds against TEN noise (Fast TEN method) were also performed. The Tinnitus Handicap Inventory (THI) questionnaire was used to assess the impact of tinnitus on daily life. The aim was to examine the correlation between the results of psychoacoustic and audiometric tests and the THI questionnaire results. Twenty-five participants (13 men, 12 women) took part in the study, carrying out two stages of the investigations. The first phase included audiometric tests such as tonal audiometry, high-frequency audiometry, impedance audiometry and distortion product otoacoustic emission (DPOAE). The second phase included specialized tests such as Fast TEN and psychoacoustic tinnitus assessments. The THI questionnaire was used to assess the impact of tinnitus on daily functioning.

Results: The results showed no significant correlation between hearing thresholds and tinnitus frequency, nor between DPOAE SNR values and tinnitus frequency. However, a significant correlation was found between otoacoustic emission scores and the corresponding tinnitus loudness level, with a decrease in DPOAE SNR corresponding to an increase in tinnitus loudness. No significant increase in masking thresholds was observed on the Fast TEN test for any frequency. While no correlation was found between MML and Q-factor, significant correlations were found between MML and tinnitus annoyance, with higher MML coefficients correlating with higher THI scores, especially in the emotional subscale (THI E).

Conclusions: This study represents a new approach, especially in comparing objective and subjective tinnitus scores, and its findings may be useful for future research, as the current literature lacks clear guidelines for tinnitus diagnosis.

Tinnitus and deafness – what are the solutions?

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Introduction: Cochlear implantation (CI) is most often prescribed not only for profound bilateral hearing loss, but also as a way to rehabilitate patients from tinnitus in the presence of deafness.

Aim: The aim of our study was to investigate changes in tinnitus characteristics in patients after CI.

Material and methods: We examined 2 groups of patients suffering from tinnitus: 4 patients with unilateral acquired deafness and 50 patients with bilateral sensorineural hearing loss of degree 4. All received CI in one ear. The severity of tinnitus in patients was assessed using a visual analogue scale from 0 to 10 points for 2 years. Using a questionnaire and the use of statistical methods, the dependence of the dynamics of tinnitus on gender, age, duration and etiology of deafness was analyzed.

Results: The majority of patients in both groups 1 and 2 noted a decrease in the level of tinnitus after the first fitting of the sound processor CI (SP). Of these, in 54% of cases, tinnitus decreased only with the use of a SP. For 42%, the effect persisted even when the SP was turned off. In 4% of cases, tinnitus remained unchanged. In patients with a period of deafness of less than 5 years, the most pronounced reduction in tinnitus level was noted 2 months after connecting the SP. After 24 months, the most significant reduction in tinnitus was observed in patients with a score of 3–7 points before the CI. In patients with a period of deafness of more than 15 years, the most pronounced reduction in tinnitus levels was observed 48 months after connecting the SP. In 1 patient of group 1 and 2 patients of group 2, the noise remained unchanged 24 months after connecting the SP CI.

Conclusions: Dynamic observation for 24 months suggested the heterogeneity of the groups of these patients. Restoration of the peripheral part cannot always completely compensate for the central mechanisms of tinnitus. For severe deafness, cochlear implantation remains the most effective method of rehabilitation for patients with tinnitus.