He benefits, he doesn't benefit, she benefits, she doesn't benefit ...

It is always the same picture: There is a new tinnitus treatment study coming out, you look at the results and you discover a large heterogeneity in the treatment responses. There is always a group of patients that benefit from the treatment and there are others that don't benefit. If the authors of the study were lucky, there are more responders than non-responders, but this rarely occurs – and almost never you find a homogenous picture of the study results. Are the positive outcomes in these studies only unsystematic “lucky strikes” or does this response heterogeneity reveal to us an essential piece of information about the nature of tinnitus? Several findings indicate that the diversity of patients characteristics can - at least partially - explain why some patients benefit and others don't. One example is the regular use of hearing aids and noisers. Patients with an individual tinnitus pitch below 6 kHz benefit from a long-term use of these devices by a reduction of tinnitus loudness and distress, whereas patients with a pitch above 6 kHz don't benefit (see Schaette et al., 2010; McNeill 2012). Another example is the treatment with neurofeedback. Typically, the brain activity in the tinnitus patients can be characterized by reduced alpha (8-12 Hz) and enhanced delta (1-4 Hz) activity in the temporal cortex. During the neurofeedback intervention, patients are instructed to modulate this tinnitus-related brain activity and receive feedback for successfull changes towards the normal and tinnitus-free brain activity. Patients that are able to modulate their brain activity in the desired direction indeed benefit from the treatment and report a reduction of tinnitus loudness and distress, while patients that are not able to modulate their brain activity don’t benefit (see e.g. Dohrmann et al. 2007, Hartmann et al. 2013)

Yet, we already have a large variety of treatment approaches ranging from technical over pharmaceutical and behavioral interventions that are beneficial for certain tinnitus subtypes. On the other side, there is a diverse mass of tinnitus patients characterized by various clinical and demographic variables. The remaining question is now: How can we navigate the individual tinnitus patient to the treatment approach that helps him or her the most?
As long as we have no more effective treatments at hand the best possible assignment of the best treatment to the individual patient is one of the major research challenges in the tinnitus field for the next years. We need to learn more about which tinnitus patients benefit from what treatment approach - and under which circumstances. We have to improve the diagnostic measures and procedures in order to fine-tune the classification of the tinnitus patients. We have to find innovative ways to effectively combine two or more existing treatment approaches to enhance the benefits for the patients and need to scout for radically new intervention strategies that lead to a change of the tinnitus percept. Finally we need to set up an organizational structure to help the ordinary tinnitus patient finding the right place with the most beneficial treatment for him.

With the Tinnitus Research Initiative being an organization that brings together scientists, clinicians and technicians from many different disciplines we already have a network of people with enough knowledge and experience to master such an endeavor. One important step towards this goal is the implementation of the smartphone app "TrackYourTinnitus", which will be launched by TRI soon. This app allows the patients to track their tinnitus loudness and distress during their daily activities and analyze their individual results on an online platform. Integrating this data further with the individual patient characteristics and treatment experience will allow the discovery of circumstances under which the tinnitus improves and worsens. With this knowledge we will be able to further improve the treatment strategies and treatment assignment of the patients. We will inform you in this newsletter as soon as the app is ready for use.

Ana Belén Elgoyhen  Dirk De Ridder  Berthold Langguth
Winfried Schlee  Sylvia Dorner-Mitschke

Literature:


RESEARCH HIGHLIGHTS


This large cohort study which observed patient with acoustic neuroma. By finding a reduction of tinnitus after microsurgery and radiosurgery where the tinnitus worsened in patients without any intervention, this study provides guidance for the management of patients with acoustic neuroma and tinnitus.


This study confirms earlier reports of a critical involvement of the paraflocculus in tinnitus generation. Moreover it demonstrates, that tinnitus related alterations in the paraflocculus are mediated by glutamatergic transmission.


A comprehensive clinically oriented review on tinnitus in one of the most prestigious clinical journals.


Sound amplification with hearing aids is among the most widely used treatment approaches. This systematic investigation provides evidence based guidance for the choice of settings for best interference with tinnitus.


This review discusses the relevance of attentional mechanisms for tinnitus, based on behavioural, electrophysiologic and neuroimaging data. It is proposed that the prediction error between expected sound and input from the damaged cochlea may be a critical factor for maintaining the attention on tinnitus.


It is still largely unresolved which factors play a role in the transition from acute to chronic tinnitus. This imaging study which investigated the transition from acute to chronic back pain revealed that specific patterns of brain connectivity, which were already existent at pain onset, predicted who will recover from acute pain and in whom the acute pain will become chronic.


A review covering neuronal mechanisms, diagnosis and treatment of tinnitus.
Guest Speakers

Prof Cliff Abrahams (NZ). Dept of Psychology, the University of Otago.

Prof Lorimer Moseley (Australia). Clinical Neurosciences and Physiotherapy, University of South Australia.

Prof Peter Hunter (NZ). Director of the Auckland Bioengineering Institute, the University of Auckland.

Keynote speakers

Prof Deb Hall (UK). Director National Institute for Health Research, Hearing Biomedical Research Unit, Nottingham.

Prof Larry Roberts (Can). Professor Emeritus the Department of Psychology, Neuroscience and Behaviour, McMaster University.

Prof Pim Van Dijk (Neth). Professor of Audiology at University Medical Center Groningen.

Prof Robert Sweetow (USA) Professor of Otolaryngology, University of California, San Francisco.

Invited speakers

Dr Alain Londero (Fr). Otolaryngology, Georges Pompidou Hospital, Paris.

Prof William Martin (USA). Director OHSU Tinnitus Clinic, Otolaryngology/Head and Neck Surgery, Public Health & Preventive Medicine at the Oregon Health & Science University, Portland.

Prof Susan Shore (USA). Otolaryngology, Molecular and Integrative Physiology and Biomedical Engineering, University of Michigan.

Dr Jae-Jin Song (Sth Kr). Department of Otorhinolaryngology Head and Neck Surgery, Seoul National University Hospital.

Dr Berthold Langguth (Ger). Chairman of Tinnitus Research Initiative, Department of Psychiatry and Psychotherapy, University of Regensberg.

Dr Shujiro Minami (Ja). Dept. of Otolaryngology, National Tokyo Medical Center.

Clinical Workshop

Prof William Martin (USA). Director OHSU Tinnitus Clinic, Otolaryngology/Head and Neck Surgery, Public Health & Preventive Medicine at the Oregon Health & Science University, Portland.

Dr Alain Londero (Fr). Otolaryngology, Georges Pompidou Hospital, Paris.

Prof Robert Sweetow (USA). Professor of Otolaryngology, University of California, San Francisco.

Myriam Westcott (Aus). Director Dineen Westcott Moore Audiology, Melbourne.

Dr Natan Bauman (USA). Director New England Tinnitus and Hyperacusis Clinic.

Assoc Prof Amr El Refaie (Aus). Head of Clinical Audiology, Human Communication Sciences La Trobe University.

Prof Dirk De Ridder (NZ). Neurological Foundation Chair of Neurosurgery, the University of Otago.

Dr Grant D Searchfield (NZ). Centre for Brain Research; Head of Audiology, Director Hearing and Tinnitus Clinic, the University of Auckland.

REGISTER NOW  www.tri2014.org.nz
Upcoming Meetings

The Ear Foundation - Implantable Devices 2013: The State of the Art
When: November 07, 2013
Where: National College for School Leadership, Nottingham UK
Detailed Information: http://www.earfoundation.org.uk/education/articles/709

28. Politzer Society Meeting
When: November 14 – 17, 2013
Where: Susesi Resort, Antalya, Turkey
Detailed Information: http://www.politzer2013.org

ASHA 2013 Annual Convention
When: November 14 – 16, 2013
Where: McCormick Place, Chicago, IL, USA
Detailed Information: http://www.asha.org/events/convention/

British Academy of Audiology 10th Annual Conference
When: November 18 – 19, 2013
Where: Manchester Central Conference Center, Manchester, United Kingdom
Detailed Information: http://www.baaudiology.org

9th Asia Pacific Symposium on Cochlear Implant and Related Sciences (APSCI 2013)
When: November 26 – 29, 2013
Where: Hyderabad International Convention Centre, Hyderabad, India
Detailed Information: http://www.apsci2013.in/

166th Meeting of the Acoustical Society of America
When: December 02 – 06, 2013
Where: San Francisco, CA, USA
Detailed Information: http://acousticalsociety.org/meetings/san_francisco

ARO (The Association for Research in Otolaryngology) 37th MidWinter Meeting
When: February 22 – 26, 2014
Where: San Diego, CA, USA
Detailed Information: http://www.aro.org/mwm/mwm.html
March 2014

Tinnitus & Hyperacusis Therapy Masterclass
When: March 03 – 07, 2014
Where: Birkbeck College, University of London, London, UK
Detailed Information: http://tinnitustherapy.org.uk/

41st Annual AAS Scientific and Technology Conference of the American Auditory Society
When: March 06 – 08, 2014
Where: Scottsdale, AZ, USA
Detailed Information: http://www.amauditorysoc.org/dates-and-location

TRI2014 – 8th International TRI Conference on Tinnitus 2014
Over the Horizon
When: March 10 – 13, 2014
Where: Auckland, New Zealand

ICA 2014 - XXXII International Congress of Audiology
When: March 23 – 27, 2014
Where: Sydney, Australia
Detailed Information: http://www.isa-audiology.org/

AudiologyNOW! 2014
When: March 26 – 29, 2014
Where: Orlando, FL, USA

May 2014

XXXII World Congress of Audiology
When: May 03 – 07, 2014
Where: Brisbane Convention and Exhibition Center, Brisbane, Australia
Detailed Information: http://www.wca2014.com/

167th Meeting of the Acoustical Society of America (ASA)
When: May 05 – 09, 2014
Where: Providence, RI, USA
Detailed Information: http://acousticalsociety.org/meetings

ITS'14 – XI. International Tinnitus Seminar
When: May 21 – 24, 2014
Where: Langenbeck Virchow Haus, Berlin, Germany
Detailed Information: http://www.international-tinnitus-seminar-2014.com
HEAL 2014: Hearing Across the Lifespan  
NHS and AHS Conferences in one single event

When: June 05 – 07, 2014  
Where: Cernobbio (Lake Como), Italy  
Twitter: @HEAL2014

OHBM 2014: 20th Annual Meeting of the Organization for Human Brain Mapping

When: June 08 – 14, 2014  
Where: Hamburg, Germany  
Detailed Information: [http://www.humanbrainmapping.org](http://www.humanbrainmapping.org)

22th Annual Management of the Tinnitus Patient Conference

When: June 13 – 14, 2014  
Where: The University of Iowa, Iowa City, IA, USA  
Detailed Information: [http://www.medicine.uiowa.edu/oto/tinnituscourse/](http://www.medicine.uiowa.edu/oto/tinnituscourse/)

13th International Conference on Cochlear Implants and Other Implantable Auditory Technologies

When: June 18 – 21, 2014  
Where: Gasteig Munchen GmbH, Germany  

5th International Conference on Auditory Cortex

When: September 13 – 17, 2014  
Where: Herrenkrug Parkhotel Magdeburg, Germany  

59. Internationaler Hörgeräteakustiker-Kongress EUHA

When: October 15 – 17, 2014  
Where: Hannover, Germany  
Detailed Information: [http://www.euha.org/veranstaltungen/](http://www.euha.org/veranstaltungen/)
Recently published literature (articles of authors who are collaborating with TRI are marked in blue)

I Epidemiology

Sickness absence due to otoaudiological diagnoses; a descriptive nationwide study.
BMC Public Health. 2013 Jul 8;13(1):635. [Epub ahead of print]

Friberg E, Rosenhall U, Alexanderson K.

BACKGROUND: Hearing difficulties constitute a large public health problem. Knowledge about their consequences in terms of sickness absence due to otoaudiological diagnoses is very scarce. The aim of this study was to gain such knowledge. Both individuals with sick leave due to otoaudiological diagnoses and sick-leave spells due to these diagnoses were examined, in a nationwide setting. METHODS: Through Swedish nationwide registers we identified all 4768 individuals, aged 16--64 years and living in Sweden who were sickness absent due to otoaudiological diagnoses (ICD10; H60-H95) in 2005. We described the demographic characteristics of these individuals, as well as aspects regarding prevalence and duration of such sick-leave spells, in general and in four specific diagnosis groups; otological, hearing, vertigo, and tinnitus. RESULTS: Sick leave due to otoaudiological diagnoses was more common among women in all diagnosis groups except with tinnitus. Individuals with a hearing or tinnitus sick-leave diagnosis had a higher educational level and were hospitalized fewer days compared to those sickness absent due to vertigo or otological diagnoses. Particularly, sick-leave spells due to hearing or tinnitus diagnoses tended to be long, in many cases lasting the entire year. The majority of the individuals only had one sick-leave spell in 2005. CONCLUSIONS: Although the actual number of individuals with a sick-leave spell due to specific otoaudiological diagnosis might not be considered high, the high prevalence of long sick-leave spells due to particularly hearing and tinnitus diagnoses indicates the importance of preventive and rehabilitative actions. Free full text.

Profile of ear diseases among elderly patients in Sagamu, south-western Nigeria.

Olusola AS.

Department of Surgery, College of Health Sciences, Olabisi Onabanjo University, Sagamu, Nigeria. ayosogebi2000@yahoo.com.

BACKGROUND: The elderly constitute a vulnerable group which other people often misunderstand, misrepresent and are potentially prone to abuses and suboptimal care. Ear diseases are important as they may affect the wellbeing of elderly patients and their quality of life. This study took an inventory of the pattern of ear diseases among elderly patients. METHODS: A five year descriptive retrospective analysis of the clinical information on the elderly patients who presented with Ear Diseases at the ENT Clinic of our hospital. RESULTS: Data was retrieved from 165 patients and analyzed. Average age was 70 years and females constituted 53.3% of the patients. The three leading symptoms experienced by the patients were tinnitus (84.2%), hearing loss (72.1%) and earache (32.7%) while 57.0% of the diseases affected both ears. The major clinical diagnoses were Presbycusis (38.2%), Otitis (25.5%), and wax impaction (18.8%). Majority (67.3%) of the patients had single pathology while most of the ear diseases affected the inner ear. CONCLUSION: There was a relatively high prevalence of ear diseases among our elderly patients. The need for proper clinical evaluation of patients with ear diseases was emphasized. The importance of screening for hearing impairment in the elderly patients was also stressed.
Epidemiology of Noise-Induced Tinnitus and the Attitudes and Beliefs towards Noise and Hearing Protection in Adolescents.


University Department of Otorhinolaryngology and Head & Neck Surgery, Antwerp University Hospital, Edegem, Belgium; Faculty of Medicine, Campus Drie Eiken, Antwerp University, Wilrijk, Belgium; Tinnitus Research Initiative Centre (TRI), Antwerp University Hospital, Edegem, Belgium.

BACKGROUND AND OBJECTIVES: Previous research showed an increase of noise-induced symptoms in adolescents. Permanent tinnitus as a consequence of loud music exposure is usually considered as noise-induced damage. The objective was to perform an epidemiological study in order to obtain prevalence data of permanent noise-induced tinnitus as well as temporary tinnitus following noise exposure in a young population. In addition the attitudes and beliefs towards noise and hearing protection were evaluated in order to explain the use/non-use of hearing protection in a young population. METHODS: A questionnaire was completed by 3892 high school students (mean age: 16.64 years old, SD: 1.29 years). The prevalence of temporary and permanent tinnitus was assessed. In addition the 'Youth Attitudes to Noise Scale' and the 'Beliefs About Hearing Protection and Hearing Loss' were used in order to assess the attitudes and beliefs towards noise and hearing protection respectively. RESULTS: The prevalence of temporary noise-induced tinnitus and permanent tinnitus in high school students was respectively 74.9% and 18.3%. An increasing prevalence of temporary tinnitus with age was present. Most students had a 'neutral attitude' towards loud music and the use of hearing protection was minimal (4.7%). The limited use of hearing protection is explained by a logistic regression analysis showing the relations between certain parameters and the use of hearing protection. CONCLUSIONS: Despite the very high prevalence of tinnitus in such a young population, the rate of hearing protection use and the knowledge about the risks of loud music is extremely low. Future preventive campaigns should focus more on tinnitus as a warning signal for noise-induced damage and emphasize that also temporary symptoms can result in permanent noise-induced damage.

Free PMC Article.

[Possible outer hair cells hazards from occupational exposure to very low frequency electric and magnetic fields: a pilot study].
[Article in Chinese]
Lin Chung Er Bi Yan Hou Tou Jing Wai Ke Za Zhi. 2013 May;27(9):471-4.
Zhao J, Sun J, Jia Z.

Chinese PLA Postgraduate Medical School, General Hospital of Chinese PLA, Beijing, 100853, China.

OBJECTIVE: Our purpose was to investigate occupational high-strength very low frequency electric and magnetic fields (VLF EMFs) and assess changes of function of the inner ear. METHOD: The people exposed to high-strength VLF EMFs were divided into three groups: long-term exposure group ( > 5 years), short-term exposure group (< 5 years) and the control group. The field intensity indicator and noise analyzer were employed for the examination of the electromagnetic energy intensity and noise value at the working sites. Self-administered questionnaire was adopted. Universal hearing screening by pure tone audiometry (PTA) and distortion product otoacoustic emission (DPOAE) were done. The subjects who failed the screening tests were confirmed with auditory brainstem response (ABR) test. RESULT: The frequency of the electromagnetic field was 20 kHz, the average electric power density in job locations was 21-38 kV/m, which was higher than national standard (< 5 kV/m). Average noise-level in job locations was 52-65 dBHL, which was within the standard. Questionnaire presented that VLF EMFs might increase the incidence of headache, insomnia and tinnitus in long-term exposure. The incidence of abnormal DPOAE was higher in the subjects of the long-term exposure group than the short-term exposure group and the control group (P < 0.01). At 676, 933, 3616, 5130, 7253 Hz, the DPOAE amplitudes of the long term exposure group workers were significantly lower than the short-term exposure group and the control group. There was no obvious difference of the incidence of abnormal DPOAE between the short-term exposure group.
and the control group. The result of ABR with those subjects with abnormal DPOAE were no significant abnormalities. CONCLUSION: The average electric power density in job locations was significant worse than health standards. The changes of DPOAE indicated that the exposure to high-strength VLF EMFs had a subtle, discreet and local ized impairing effect on outer hair cells. Effective intervention measures should be taken.


Loprinzi PD, Lee H, Gilham B, Cardinal BJ.

Department of Exercise Science, Lansing School of Nursing and Health Sciences, Bellarmine University, 2001 Newburg Road, Louisville, KY 40205, USA. ploprinzi@bellarmine.edu.

PURPOSE: Internet-based claims suggest that physical activity may help to relieve tinnitus symptoms. The purpose of this study was to empirically investigate the association between accelerometer-assessed physical activity and tinnitus (i.e., ringing, roaring, or buzzing in the ears). METHOD: Data were obtained from the 2005-2006 National Health and Nutrition Examination Survey on 963 adolescents (aged 12-19 years old) and 473 older adults (aged 70-85 years old). Physical activity was measured using an accelerometer, and participants were asked several tinnitus-related questions. RESULTS: The weighted prevalence of tinnitus was 8.9% and 25.3% for adolescents and older adults, respectively. For every 1-min increase in moderate-to-vigorous physical activity, adolescents were 4% less likely to have tinnitus lasting more than 3 months compared with less than 3 months (OR = 0.96, 95% CI [0.93, 0.99]). For older adults with hypertension, for every 60-min increase in light-intensity physical activity, they were 21% less likely to have tinnitus compared with not having tinnitus (OR = 0.790, 95% CI [0.649, 0.963]). CONCLUSION: Overall, we conclude that physical activity was associated with tinnitus status in a nationally representative sample of adolescents and older adults. If additional studies confirm these findings, then audiologists and other hearing specialists are encouraged to promote physical activity among their patients to help treat and prevent tinnitus.

[Study on gender difference of tinnitus in medical staff]. [Article in Chinese]
Lin Chung Er Bi Yan Hou Tou Jing Wai Ke Za Zhi. 2013 May;27(10):465-7, 472.

Li Z, Qi M, Zeng X.

Department of Otolaryngology-Head and Neck Surgery, the Third Affiliated Hospital of Sun Yat-sen University, Guangzhou, 510630, China.

OBJECTIVE: To investigate whether there is gender difference in the incidence and severity of tinnitus in medical staff (including doctors, nurses, and technicians). METHOD: A total of 354 people (all are medial stuff from hospitals in Guangzhou) were invited to be involved in the investigation and granted a self-reported questionnaire of tinnitus (designed by the authors; based on the scoring method of severity of tinnitus (Liu et al.). Statistical analysis on the data was performed using SPSS Statistics 17.0. RESULT: (1) The incidence of tinnitus of the sample was 43.22%, with that in female higher than in male (P < 0.05), and that in nurses higher than in doctors or technicians (P < 0.01). (2) The effect of working position factor on the incidence of prolonged tinnitus was significant (P < 0.01). However, no statistically significant gender difference was detected in the incidence of prolonged tinnitus. (3) There was no statistically significant difference of tinnitus severity scores between different genders or among different positions (P > 0.05). (4) There was statistically significant difference among the four sub-items of the questionnaire (P < 0.01), with the mean score of "occurred environment" higher than "the impact on sleeping", "the impact on everyday life", and "the impact on emotion".CONCLUSION: (1) The effort-reward imbalance might be the key factor of the gender difference in the incidence of tinnitus. (2) For patients of tinnitus, improving the knowledge about their symptoms as well as levels of psychological resilience would be helpful to relieve the mental impairment of tinnitus.
Survey and clinical feature analysis of the aged subjective tinnitus in a community.

Li YL, Tang Z, Yu XF.

ENT Department, Shunde Affiliated First People’s Hospital of Southern Medical University, Shunde 528300, China. E-mail: damaodoctor@126.com.

OBJECTIV: To investigate the basic incidence of subjective tinnitus in Xingui Community, Daliang, Shunde District, Guangdong Province, conduct preliminary analysis on its clinical feature, provide scientific evidence for subjective tinnitus prevention and cure in community. METHODS: Performed census in the entire population, totally 17253 people in Xingui Community, then gave tinnitus surveys for the people who have subjective tinnitus, and finally conducted analysis and evaluation. RESULTS: the morbidity of tinnitus in the investigated people is 28.7%. With the increases of age, the morbidity goes up gradually, but it is not statistically significant(P>0.05) among different age group, and between different sex. There is an obvious correlation between tinnitus and hearing loss; Matching tone of tinnitus is related to the nature of hearing loss. The morbidity of decompensation tinnitus is 3.2%, it is not statistically significant among different age group(P>0.05). CONCLUSION: subjective tinnitus is common in aged people, so it is very important to strengthen the work of subjective tinnitus prevention and cure in Community.

Hearing of 75-year old persons over three decades: Has hearing changed?

Rosenhall U, Möller C, Hederstierna C.

* Department of Audiology and Neurotology, Karolinska University Hospital, Stockholm and Department of Clinical Science, Intervention and Technology, Karolinska Institutet, Stockholm, Sweden.

Objective: The state of hearing in 75-year old persons was measured in a population based epidemiological study with the aim of studying if hearing had changed during a time span of 29 years. Design: An epidemiological study of generational effects in three age cohorts. Study sample: Three age cohorts were included: cohort 1 (n: 267) born in 1976-77, cohort 4 (n: 197) in 1990-91, and cohort 6 (n: 570) in 2005. The same test procedures using pure-tone audiometry and a short questionnaire were applied to the three cohorts of 75-year old residents in the same city. Results: The hearing was essentially unchanged during the span of the investigation-almost three decades. Low-frequency hearing was up to about 10 dB poorer in the most recently studied cohort compared to the previously studied cohorts. The reason for this difference is considered to depend on methodological factors. Self-assessed hearing and tinnitus was mainly unchanged, or had minor changes both to the better and to the worse. Conclusions: The hearing, both measured with pure-tone audiometry and with a short questionnaire, of 75-year old persons has not changed at all, or only marginally, over three decades.
Annoyance evaluation and the effect of noise on the health of bus drivers.

Bruno PS, Marcos QR, Amanda C, Paulo ZH.
Laboratory of Biomechanics and Ergonomics, University of Middle-West-UNICENTRO; Laboratory of Environmental and Industrial Acoustics and Acoustic Comfort, Federal University of Parana-UFPR, Brazil.

In the present study, we evaluated annoyance and the effects of noise on the health of bus drivers. For that, 200 bus drivers from a public transport company participated in a cross-sectional study. Annoyance and effects on health was measured with analog scale: Sleep quality, occurrence of tinnitus, headache, irritation, and annoyance from bus engine, traffic, and passengers. Data of age and working time of bus drivers also were obtained. For noise exposure, LA eq was evaluated in 80 buses. Statistical analysis consisted of mean, standard deviation, minimum, and maximum, Kruskal-Wallis test with post-hoc Dunn, one-way ANOVA with post-hoc Tukey and Spearman's correlation coefficient. Results indicate three groups of bus drivers (not annoyed: (N.A.), a little annoyed (L.A.) and highly annoyed (H.A.)). The group H.A. was younger and with less working time in relation to others, with a significant difference only for age. Regarding sleep quality, there was no significant difference. For results on the occurrence of tinnitus, headache and irritation after work, group H.A. had significantly higher means. Result of annoyance to the bus engine was significantly higher in H.A. than in L.A. and N.A. Annoyance to traffic and passengers, no significant differences were found, but the highest results were found for L.A., followed by H.A. and N.A. Equivalent sound pressure level in buses was above of the limit for occupational comfort. It was concluded that bus drivers has considerable level of noise annoyance and some health effects are perceived. The noise is a factor discomfort ergonomic that may cause effects on health of bus drivers. This study aims to evaluate annoyance and the effects of noise on the health of bus drivers. Cross-sectional study with buses and bus drivers. For that, 200 bus drivers from a public transport company participated in a cross-sectional study. Annoyance and effects on health was measured with analog scale: Sleep quality, occurrence of tinnitus, headache, irritation and annoyance from bus engine, traffic, and passengers. Data of age and working time of bus drivers also were obtained. For noise exposure, LA eq was evaluated in 80 buses. Statistical analysis consisted of mean, standard deviation, minimum and maximum, Kruskal-Wallis test with post-hoc Dunn, one-way ANOVA with post-hoc Tukey and Spearman's correlation coefficient. Results indicate three groups of bus drivers (N.A., a L.A. and H.A.). The group H.A. was younger and with less working time in relation to others, with a significant difference only for age. Regarding sleep quality, there was no significant difference. For results on the occurrence of tinnitus, headache and irritation after work, group H.A. had significantly higher means. Result of annoyance to the bus engine was significantly higher in H.A. than in L.A. and N.A. Annoyance to traffic and passengers, no significant differences were found, but the highest results were found for L.A., followed by H.A. and N.A. Equivalent sound pressure level in buses was above of the limit for occupational comfort. It was concluded that bus drivers has considerable level of noise annoyance and some health effects are perceived.

McCormack, A., Edmondson-Jones, M., Fortnum, H., Dawes, P., Middleton, H., Munro, K., Moore, D.

NIHR Nottingham Hearing Biomedical Research Unit, Ropewalk House, 113 The Ropewalk, Nottingham NG1 5DU, UK; School of Clinical Sciences, University of Nottingham, UK; MRC Institute of Hearing Research, University Park, Nottingham NG7 2RD, UK; School of Psychological Sciences, University of Manchester, UK; School of Sociology and Social Policy, University of Nottingham, UK; Nottinghamshire Healthcare NHS Trust, UK; Central Manchester University Hospitals NHS Foundation Trust, Manchester Academic Health Science Centre, Oxford Road, Manchester, UK; Cincinnati Children's Hospital Medical Center, Cincinnati, OH 45213, USA.

Background: Previous research has suggested that a substantial proportion of the population are severely affected by tinnitus, however recent population data are lacking. Furthermore, there is growing evidence that the perception of severity is closely related to personality factors such as neuroticism. Objective: In a subset (N = 172,621) of a large population sample of > 500,000 adults aged 40 to 69 years, (from the UK Biobank dataset) we calculated the prevalence of tinnitus and that which is perceived as bothersome, and examined the association between tinnitus and a putative predisposing personality factor, neuroticism. Method: Participants were recruited through National Health Service registers and aimed to be inclusive and as representative of the UK population as possible. The assessment included subjective questions concerning hearing and tinnitus. Neuroticism was self-rated on 13 questions from the Eysenck Personality Inventory. Associations between neuroticism and tinnitus were tested with logistic regression analyses. Results: Prevalence of tinnitus was significantly higher for males, and increased with age, doubling between the youngest and oldest age groups (males 13% and 26%; females 9% and 19% respectively). Of those with tinnitus, females were more likely to report bothersome tinnitus. Neuroticism was associated with current tinnitus and bothersome tinnitus, with the items: 'loneliness', 'mood swings', 'worrier/anxious' and 'miserableness', as the strongest associations of bothersome tinnitus. Conclusions: Neuroticism was identified as a novel association with tinnitus. Individuals with tinnitus and higher levels of neuroticism are more likely to experience bothersome tinnitus, possibly as a reflection of greater sensitivity to intrusive experiences. © 2013 The Authors.
Hearing loss differentially affects thalamic drive to two cortical interneuron subtypes.
J Neurophysiol. 2013 May 29. [Epub ahead of print]

Takesian AE, Kotak VC, Sharma N, Sanes DH.

New York University.

Sensory deprivation, such as developmental hearing loss, leads to an adjustment of synaptic and membrane properties throughout the central nervous system. These changes are thought to compensate for diminished sound-evoked activity. This model predicts that compensatory changes should be synergistic with one another along each functional pathway. To test this idea, we examined the excitatory thalamic drive to two types of cortical inhibitory interneurons that display differential effects in response to developmental hearing loss. The inhibitory synapses made by fast spiking (FS) cells are weakened by hearing loss, whereas those made by low threshold spiking (LTS) cells remain strong, but display greater short-term depression (Takesian et al. 2010). Whole cell recordings were made from FS or LTS interneurons in a thalamocortical brain slice, and medial geniculate (MG) evoked postsynaptic potentials were analyzed. Following hearing loss, MG-evoked net excitatory potentials were smaller than normal at FS cells, but larger than normal at LTS cells. Furthermore, MG-evoked excitatory potentials displayed less short-term depression at FS cells, and greater short-term depression at LTS cells. Thus, deprivation-induced adjustments of excitatory synapses onto inhibitory interneurons are cell-type specific, and parallel the changes made by the inhibitory afferents.

Enhanced representation of spectral contrasts in the primary auditory cortex.

Catz N, Noreña AJ.

Laboratory of Adaptive and Integrative Neurobiology, Fédération de recherche 3C, UMR CNRS 7260, Université Aix-Marseille Marseille, France.

The role of early auditory processing may be to extract some elementary features from an acoustic mixture in order to organize the auditory scene. To accomplish this task, the central auditory system may rely on the fact that sensory objects are often composed of spectral edges, i.e., regions where the stimulus energy changes abruptly over frequency. The processing of acoustic stimuli may benefit from a mechanism enhancing the internal representation of spectral edges. While the visual system is thought to rely heavily on this mechanism (enhancing spatial edges), it is still unclear whether a related process plays a significant role in audition. We investigated the cortical representation of spectral edges, using acoustic stimuli composed of multi-tone pips whose time-averaged spectral envelope contained suppressed or enhanced regions. Importantly, the stimuli were designed such that neural responses properties could be assessed as a function of stimulus frequency during stimulus presentation. Our results suggest that the representation of acoustic spectral edges is enhanced in the auditory cortex, and that this enhancement is sensitive to the characteristics of the spectral contrast profile, such as depth, sharpness and width. Spectral edges are maximally enhanced for sharp contrast and large depth. Cortical activity was also suppressed at frequencies within the suppressed region. To note, the suppression of firing was larger at frequencies nearby the lower edge of the suppressed region than at the upper edge. Overall, the present study gives critical insights into the processing of spectral contrasts in the auditory system. Free PMC Article.
Tinnitus, unipolar brush cells, and cerebellar glutamatergic function in an animal model.

Bauer CA, Wisner KW, Baizer JS, Brozoski TJ.

Department of Otolaryngology, Southern Illinois University School of Medicine, Springfield, Illinois, United States of America.

Unipolar brush cells (UBCs) are excitatory interneurons found in the dorsal cochlear nucleus (DCN) and the granule cell layer of cerebellar cortex, being particularly evident in the paraflocculus (PFL) and flocculus (FL). UBCs receive glutamatergic inputs and make glutamatergic synapses with granule cells and other UBCs. It has been hypothesized that UBCs comprise local networks of tunable feed-forward amplifiers. In the DCN they might also participate in feed-back amplification of signals from higher auditory centers. Recently it has been shown that UBCs, in the vestibulocerebellum and DCN of adult rats, express doublecortin (DCX), previously considered a marker of newborn and migrating neurons. In an animal model, both the DCN, and more recently the PFL, have been implicated in contributing to the sensation of acoustic-exposure-induced tinnitus. These studies support the working hypothesis that tinnitus emerges after loss of peripheral sensitivity because inhibitory processes homeostatically down regulate, and excitatory processes up regulate. Here we report the results of two sequential experiments that examine the potential role of DCN and cerebellar UBCs in tinnitus, and the contribution of glutamatergic transmission in the PFL. In Experiment 1 it was shown that adult rats with psychophysical evidence of tinnitus induced by a single unilateral high-level noise exposure, had elevated DCX in the DCN and ventral PFL. In Experiment 2 it was shown that micro-quantities of glutamatergic antagonists, delivered directly to the PFL, reversibly reduced chronically established tinnitus, while similarly applied glutamatergic agonists induced tinnitus-like behavior in non-tinnitus controls. These results are consistent with the hypothesis that UBC up regulation and enhanced glutamatergic transmission in the cerebellum contribute to the pathophysiology of tinnitus.

Free PMC Article.

[Hidden hearing loss in tinnitus patients with normal audiograms: implications for the origin of tinnitus].
[Article in Chinese]
Lin Chung Er Bi Yan Hou Tou Jing Wai Ke Za Zhi. 2013 Apr;27(7):362-5.

Xiong H, Chen L, Yang H, Li X, Qiu Z, Huang X, Zheng Y.

Department of Otolaryngology, Sun Yat-sen Memorial Hospital, Sun Yat-sen University, Guangzhou 510120, China.

OBJECTIVE: To investigate hidden hearing loss in tinnitus patients with normal audiograms by means of auditory brainstem response (ABR) and explore the origin of tinnitus. METHOD: Pure tone thresholds, ABR thresholds, amplitude of wave I and wave V of ABR were analyzed in 40 tinnitus patients and 15 controls. RESULT: There was no significantly difference in pure tone thresholds and ABR thresholds between those tinnitus patients and controls while a reduced amplitude of wave I and normal amplitude of wave V of ABR in the tinnitus patients became evident. CONCLUSION: Tinnitus patients with normal audiograms have hidden hearing loss at the level of primary auditory nerve and the generation of tinnitus is likely attributed to a homeostatic response of neurons in brainstem.
Effect of tinnitus on distortion product otoacoustic emissions varies with hearing loss.

Husain FT.
University of Illinois at Urbana-Champaign.

PURPOSE: The aim of this study was to measure the effect of tinnitus, while accounting for the effect of hearing loss and aging, on distortion product otoacoustic emissions (DPOAEs). METHOD: DPOAEs were measured twice in both ears in 5 groups of participants: young adults with normal hearing, middle-age adults with normal hearing, adults with high-frequency sensorineural hearing loss, age-matched adults with similar hearing loss and tinnitus, and adults with normal hearing and chronic tinnitus. RESULTS: Multivariate analysis revealed a main effect of hearing loss and age, but no effect of tinnitus, across all 5 groups. Separate tests revealed significant effects of age and tinnitus in the normal-hearing groups and hearing loss in adults with or without tinnitus, but no effect of tinnitus in those with hearing loss. CONCLUSION: DPOAE levels in the group of adults with hearing loss and tinnitus were diminished, but those in the group with normal hearing and tinnitus were enhanced, relative to DPOAE levels in the controls. Outer hair cell function, as indexed by DPOAEs, exhibits a complex association with tinnitus, and this has implications in the use of DPOAEs as a tool both for testing for tinnitus presence and for creating a model of neural mechanisms underlying tinnitus.

Role of attention in the generation and modulation of tinnitus.

Roberts LE, Husain FT, Eggermont JJ.

Department of Psychology, Neuroscience, and Behaviour, McMaster University, 1280 Main Street West, Hamilton, Ontario L8S 4K1, Canada. Electronic address: roberts@mcmaster.ca.

Neural mechanisms that detect changes in the auditory environment appear to rely on processes that predict sensory state. Here we propose that in tinnitus there is a disparity between what the brain predicts it should be hearing (this prediction based on aberrant neural activity occurring in cortical frequency regions affected by hearing loss and underlying the tinnitus percept) and the acoustic information that is delivered to the brain by the damaged cochlea. The disparity between the predicted and delivered inputs activates a system for auditory attention that facilitates through subcortical neuromodulatory systems neuroplastic changes that contribute to the generation of tinnitus. We review behavioral and functional brain imaging evidence for persisting auditory attention in tinnitus and present a qualitative model for how attention operates in normal hearing and may be triggered in tinnitus accompanied by hearing loss. The viewpoint has implications for the role of cochlear pathology in tinnitus, for neural plasticity and the contribution of forebrain neuromodulatory systems in tinnitus, and for tinnitus management and treatment. Copyright © 2013 Elsevier Ltd. All rights reserved.
Auditory efferent dysfunction in normal-hearing chronic idiopathic tinnitus.

Hsu SY, Wang PC, Yang TH, Lin TF, Hsu SH, Hsu CJ.
Department of Otolaryngology, Cathay General Hospital, Taipei, Taiwan.

OBJECTIVE: To investigate the function of the auditory efferent system in patients with chronic idiopathic tinnitus, but normal pure-tone audiograms. METHODS: We studied 15 subjects with normal hearing that had experienced either unilateral or bilateral persistent tinnitus for at least 3 months. The ears of the 15 subjects were classified into tinnitus-positive-ear (TPE) and tinnitus-negative-ear (TNE) groups. The control-ear group (CE) comprised the ears of 15 subjects with normal hearing and no tinnitus. We measured different types of otoacoustic emissions (OAEs), including spontaneous (SOAEs), transient evoked (TEOAEs), and distortion product (DPOAEs). We also analyzed contralateral suppression of OAEs and auditory brainstem responses (ABRs). Data were compared among TPE, TNE, and CE groups. RESULTS: The data associated with cochlear mechanics, including the prevalence of SOAEs, the number of SOAE peaks, and the overall TEOAE responses in the absence of a contralateral stimulus, were not significantly different among the TPE, TNE, and CE groups. In the TPE group, contralateral stimuli failed to significantly suppress overall TEOAEs, and contralateral suppression of DPOAEs was significantly reduced over a limited frequency range. Furthermore, the TPE group showed prolonged latencies in waves III and V of ABRs. CONCLUSION: This study demonstrated that abnormal contralateral suppression of OAEs and ABRs indicated a dysfunction in the ipsilateral efferent medial olivocochlear system; this might play a role in normal-hearing tinnitus.

Prevalent hallucinations during medical internships: phantom vibration and ringing syndromes.

Lin YH, Lin SH, Li P, Huang WL, Chen CY.
Department of Psychiatry, National Taiwan University Hospital, Yun-Lin Branch, Yunlin, Taiwan.

BACKGROUND: Phantom vibration syndrome is a type of hallucination reported among mobile phone users in the general population. Another similar perception, phantom ringing syndrome, has not been previously described in the medical literature. METHODS: A prospective longitudinal study of 74 medical interns (46 males, 28 females; mean age, 24.8±1.2 years) was conducted using repeated investigations of the prevalence and associated factors of phantom vibration and ringing. The accompanying symptoms of anxiety and depression were evaluated with the Beck Anxiety and Depression Inventories before the internship began, and again at the third, sixth, and twelfth internship months, and two weeks after the internship ended. RESULTS: The baseline prevalence of phantom vibration was 78.1%, which increased to 95.9% and 93.2% in the third and sixth internship months. The prevalence returned to 80.8% at the twelfth month and decreased to 50.0% 2 weeks after the internship ended. The baseline prevalence of phantom ringing was 27.4%, which increased to 84.9%, 87.7%, and 86.3% in the third, sixth, and twelfth internship months, respectively. This returned to 54.2% two weeks after the internship ended. The anxiety and depression scores also increased during the internship, and returned to baseline two weeks after the internship. There was no significant correlation between phantom vibration/ringing and symptoms of anxiety or depression. The incidence of both phantom vibration and ringing syndromes significantly increased during the internship, and subsequent recovery. CONCLUSION: This study suggests that phantom vibration and ringing might be entities that are independent of anxiety or depression during evaluation of stress-associated experiences during medical internships. Free PMC Article.
The role of caffeine in otorhinolaryngology: guilty as charged?
Eur Arch Otorhinolaryngol. 2013 Aug 11. [Epub ahead of print]

Trinidade A, Robinson T, Phillips JS.
ENT Department, Norfolk & Norwich University Hospital NHS Trust, Colney Lane, Norwich, NR4 7GJ, UK, aarontrinidade@gmail.com.

Caffeine is implicated as causing or aggravating numerous otorhinolaryngological conditions, including tinnitus, Ménière’s disease, laryngopharyngeal reflux, globus pharyngeus and dysphonia. We address caffeine’s effects in such conditions and to determine whether such implications are founded. The defined search limits of data sources included human trials and either randomised control trials, meta-analyses, editorials, letters, clinical trials, case reports, comments or journal articles over the last 40 years. MEDLINE, EMBASE and CINAHL databases were searched using ‘otorhinolaryngological diseases’ and ‘caffeine’ as a duplicate filter. PubMed databases were searched using ‘caffeine’ in combination with ‘tinnitus’, ‘Ménière’s’, ‘vertigo’, ‘motion sickness’, ‘imbalance’, ‘vestibular migraine’, ‘voice’, ‘vocal hygiene’, ‘reflux’, ‘ear’, ‘nose’, ‘throat’ and ‘head neck cancer’, respectively. Searches were not limited to the English language. MEDLINE, EMBASE and CINAHL database searches identified 417 papers. Of these, 200 abstracts were chosen for further scrutiny, following which 30 full manuscripts were chosen for full review. The PubMed database search identified 275 abstracts of which 33 were reviewed. Of the total 692 studies searched, 63 studies were reviewed and 36 were finally used. At present, there is little evidence in the literature to support the notion that caffeine causes or aggravates otorhinolaryngological conditions. In tinnitus, its withdrawal may actually worsen symptoms whereas in motion sickness, there is some clinical evidence for its benefit. More research is needed into the role caffeine plays in otorhinolaryngological conditions to allow clinicians to give informed advice to their patients.

Self-reported symptoms in patients with idiopathic sudden sensorineural hearing loss.

Sano H, Okamoto M, Ohhashi K, Ino T, Iwasaki S, Ogawa K.
* Department of Otorhinolaryngology, Kitasato University, School of Medicine, Kanagawa; † Department of Hearing implant science, Shinshu University, School of Medicine, Nagano; and ‡ Department of Otorhinolaryngology, Keio University, School of Medicine, Tokyo, Japan.

OBJECTIVE: This study evaluated self-reported symptoms in patients with idiopathic sudden sensorineural hearing loss (ISSHL). STUDY DESIGN: Cross-sectional study. SETTING: Multicenter clinical investigation in 9 university hospitals. PATIENTS: In total, 140 patients with ISSHL and 24 patients with unilateral sensorineural hearing loss (USHL; control) were included. MAIN OUTCOME MEASURES: A questionnaire on symptoms of ISSHL was distributed and the Short-Form Health Survey (Version 2) was used for assessing the quality of life. RESULTS: In response to questions on hearing difficulty, many of patients in both groups experienced symptoms. In response to questions on hearing-related discomfort, a significantly higher number of patients with ISSHL experienced symptoms compared with those with USHL. Compared with a high incidence of tinnitus in patients with ISSHL, very low incidence of tinnitus was observed in those with USHL. In the multiple linear regression analysis, hearing-related discomfort was the sole significant factor on the Mental Component Summary scores of the Short-Form Health Survey (Version 2). CONCLUSION: Many patients with ISSHL experience several symptoms such as hearing difficulty, hearing-related discomfort, tinnitus, and anxiety. Hearing-related discomfort strongly affected the quality of life in patients with ISSHL.
Brain white matter structural properties predict transition to chronic pain.

Mansour AR, Baliki MN, Huang L, Torbey S, Herrmann KM, Schnitzer TJ, Apkarian AV.
Department of Physiology, Northwestern University, Feinberg School of Medicine, Chicago, IL, USA.

Neural mechanisms mediating the transition from acute to chronic pain remain largely unknown. In a longitudinal brain imaging study, we followed up patients with a single sub-acute back pain (SBP) episode for more than 1 year as their pain recovered (SBPr), or persisted (SBPp) representing a transition to chronic pain. We discovered brain white matter structural abnormalities (n=24 SBP patients; SBPp=12 and SBPr=12), as measured by diffusion tensor imaging (DTI), at entry into the study in SBPp in comparison to SBPr. These white matter fractional anisotropy (FA) differences accurately predicted pain persistence over the next year, which was validated in a second cohort (n=22 SBP patients; SBPp=11 and SBPr=11), and showed no further alterations over a 1-year period. Tractography analysis indicated that abnormal regional FA was linked to differential structural connectivity to medial vs lateral prefrontal cortex. Local FA was correlated with functional connectivity between medial prefrontal cortex and nucleus accumbens in SBPr. As we have earlier shown that the latter functional connectivity accurately predicts transition to chronic pain, we can conclude that brain structural differences, most likely existing before the back pain-inciting event and independent of the back pain, predispose subjects to pain chronification. Copyright © 2013 International Association for the Study of Pain. Published by Elsevier B.V. All rights reserved.

Physiological, anatomical, and behavioral changes after acoustic trauma in Drosophila melanogaster.

Christie KW, Sivan-Loukianova E, Smith WC, Aldrich BT, Schon MA, Roy M, Lear BC, Eberl DF.
Biology Department, University of Iowa, Iowa City, IA 52242.
Noise-induced hearing loss (NIHL) is a growing health issue, with costly treatment and lost quality of life. Here we establish Drosophila melanogaster as an inexpensive, flexible, and powerful genetic model system for NIHL. We exposed flies to acoustic trauma and quantified physiological and anatomical effects. Trauma significantly reduced sound-evoked potential (SEP) amplitudes and increased SEP latencies in control genotypes. SEP amplitude but not latency effects recovered after 7 d. Although trauma produced no gross morphological changes in the auditory organ (Johnston's organ), mitochondrial cross-sectional area was reduced 7 d after exposure. In nervana 3 heterozygous flies, which slightly compromise ion homeostasis, trauma had exaggerated effects on SEP amplitude and mitochondrial morphology, suggesting a key role for ion homeostasis in resistance to acoustic trauma. Thus, Drosophila exhibit acoustic trauma effects resembling those found in vertebrates, including inducing metabolic stress in sensory cells. This report of noise trauma in Drosophila is a foundation for studying molecular and genetic sequelae of NIHL. Free Article.

A neuronal network model with simplified tonotopicity for tinnitus generation and its relief by sound therapy.

Nagashino H, Kinouchi Y, Danesh AA, Pandya AS.
Tinnitus is the perception of sound in the ears or in the head where no external source is present. Sound therapy is one of the most effective techniques for tinnitus treatment that have been proposed. In order to investigate mechanisms of tinnitus generation and the clinical effects of sound therapy, we have proposed conceptual and computational models with plasticity using a neural oscillator or a neuronal network model. In the present paper, we propose a neuronal network model with simplified tonotopicity of the auditory system as more detailed structure. In this model an integrate-and-fire neuron model is employed and homeostatic plasticity is incorporated. The computer simulation results show that the present model can show the generation of oscillation and its cessation by external input. It suggests that the present framework is promising as a modeling for the tinnitus generation and the effects of sound therapy.
### Diagnostics

**Correlation of tinnitus loudness and onset duration with audiological profile indicating variation in prognosis.**


**Gudwani S, Munjal SK, Panda NK, Verma RK.**

Purpose. Subjective tinnitus has different forms and degrees of severity. Many studies in the literature have assessed psychoacoustic characteristics of tinnitus but hardly any of them had focused on the association of audiological profile with onset duration and loudness perception. The aim of this study was to evaluate existence of any association between tinnitus loudness/onset duration and audiological profile to explain differences in prognosis. Method. Study design was prospective. The sample consisted of 26 subjects having tinnitus, which was divided into tinnitus and nontinnitus ears. Audiological profile included pure-tone audiometry, speech audiometry, tympanometry, acoustic reflex test, and auditory evoked potentials (early and middle latency). Unpaired t-test was applied to compare two subgroups. Correlation and association between tinnitus onset duration/loudness perception and audiological profile were also assessed by calculating Spearman's coefficient and Fischer exact value. Results. The two subgroups had significant differences for pure-tone and speech audiometry hearing thresholds. A significant association was observed between the high frequency/extended high frequency and tinnitus loudness/onset duration. Conclusion. The changes in hearing thresholds and auditory pathway are associated with an increase in tinnitus loudness and its onset duration. This knowledge would be helpful to differentiate between severity and chronicity of the patients for planning therapeutic management and predicting prognosis.

**Depression, Anxiety and Stress Scale in patients with tinnitus and hearing loss.**

Eur Arch Otorhinolaryngol. 2013 Sep 27. [Epub ahead of print]

**Gomaa MA, Elmagd MH, Elbadry MM, Kader RM.**

Department of Otorhinolaryngology, Faculty of Medicine, Minia University, Minia, Egypt, magomaa@yahoo.com.

The study was proposed to evaluate co-morbid depression, anxiety and stress associated with tinnitus patients. The study was done on 196 subjects: 100 patients suffering from subjective tinnitus associated with hearing loss (tinnitus group), 45 patients suffering from hearing loss only (hearing loss group) and 50 healthy subjects not suffering from tinnitus or hearing loss (control group); the age ranges from 20 to 60 years old. The studied sample was subjected to full ear, nose and throat examinations and audiological evaluation. Depression, Anxiety and Stress Scale (DASS) was developed by Levibond H and Levibond F to assess three self-report scales designed to measure the negative emotional status of depression, anxiety and stress. All patients and control group were evaluated by DASS. (1) Depression: males were affected more than females. All patients over 60 years were affected by depression. The duration of tinnitus seems correlating with the severity of depression. Only 2 patients (4.3 %) of the hearing loss group suffer from depression. (2) Anxiety: 90 % of males suffer from anxiety as compared to 83.3 % females. The age group 20-29 years old suffers more than other age groups. Only 4 patients (8.7 %) of hearing loss group suffer from anxiety. (3) Stress: females seem to be affected by the stress (76.7 %) more than males (67.5). Patients in age group 30-39 suffer the most from the disease. There is a direct correlation between duration of tinnitus and severity of stress. No one of the hearing loss group suffers from stress. In conclusion, depression, anxiety and stress should be taken into consideration in the treatment of patients suffering from tinnitus.
Sleep architecture variation in chronic tinnitus patients.

Attanasio G, Russo FY, Roukos R, Covelli E, Cartocci G, Saponara M.
Department of Sensory Organs, Sapienza University of Rome, Rome, Italy. giuseppe.attanasio@uniroma1.it.

OBJECTIVES: The aim of the study was to evaluate the sleep architecture and its possible alterations in chronic tinnitus patients, and investigate any possible correlation between sleep architecture modifications and tinnitus perception, adaptation, and the degree of discomfort in these patients. DESIGN: In a prospective, case-control, nonrandomized study, 18 patients affected by chronic tinnitus were compared with a homogeneous control group consisting of 15 healthy subjects. The experimental group was enrolled at the Tinnitus ambulatory at Policlinico Umberto I Department of Sensory Organs, and the control group was composed of voluntary subjects. A full overnight polysomnography was performed on both groups. Tinnitus patients answered two questionnaires: the tinnitus handicap inventory (THI) and a questionnaire concerning their subjective sleep quality, tinnitus intensity before bedtime, tinnitus intensity at remembered nocturnal wake-up periods, and tinnitus intensity at morning wake-up. Controls completed only the sleep quality questionnaire. RESULTS: All tinnitus patients had a statistically significant alteration in sleep stages. Average percentage of stage 1 + stage 2 was 85.4% ± 6.3, whereas, in the control group, the average percentage of stage 1 + stage 2 was 54.9 ± 11.2 (p < 0.001). Stages 3 and 4 and rapid eye movement (REM) sleep was lacking in all tinnitus patients with an average percentage of 6.4 ± 4.9 of REM sleep, and 6.4 ± 4.9 of stages 3 + 4. The control group showed an average percentage of 21.5 ± 3.6 of REM sleep and 21.5 ± 3.6 of stages 3 + 4 (p < 0.001). No correlation was found between the decrease of REM and the increase of the THI score in the tinnitus group (r = 0.04). However, a mild correlation was found between the increase of light sleep (stage 1 + stage 2) and the THI score reported by the tinnitus group. Therefore, patients with light sleep report a higher THI score (r = 0.4). CONCLUSIONS: The significant alteration of sleep parameters assessed in tinnitus patients underlines the necessity to consider an adequate therapy that could improve patients’ sleep quality and also opens avenues for further investigations.

Tinnitus and normal hearing: a study on contralateral acoustic reflex.
da Cruz Fernandes L, Momensohn-Santos TM, Silva Martins Carvalho J, de Queiroz Carvalho FL.
Bahia State University.

PURPOSE: The aim of this study was to evaluate the difference of the contralateral acoustic reflex (AR) threshold between adult subjects with hearing within clinically normal limits, with and without tinnitus. METHODS: Exploratory, descriptive and comparative study. STUDY SAMPLE: Forty female subjects were evaluated: 20 had tinnitus and 20 formed the control group. The contralateral AR threshold was evaluated at the frequencies of 500, 1000 and 2000 Hz. RESULTS: Elevated or absent AR thresholds were found only in subjects with complaints of tinnitus. At all frequencies and in either ear, the median AR threshold was higher in the group that complained of tinnitus 100.0 [95.0-100.0] dB compared to the control group 90.0 [86.3-95.0] dB (P < 0.01). There was a statistically significant difference (P < 0.05) in the group with tinnitus, in each of the frequencies studied and in both the right and left ear. CONCLUSION: The results suggest that evaluation of the efferent system, through AR, could be an important tool for the differential diagnosis of tinnitus in patients with otherwise hearing within clinically normal limits.
Effect of tinnitus on distortion product otoacoustic emissions varies with hearing loss.
Husain FT.
University of Illinois at Urbana-Champaign.

PURPOSE: The aim of this study was to measure the effect of tinnitus, while accounting for the effect of hearing loss and aging, on distortion product otoacoustic emissions (DPOAEs). METHOD: DPOAEs were measured twice in both ears in 5 groups of participants: young adults with normal hearing, middle-age adults with normal hearing, adults with high-frequency sensorineural hearing loss, age-matched adults with similar hearing loss and tinnitus, and adults with normal hearing and chronic tinnitus. RESULTS: Multivariate analysis revealed a main effect of hearing loss and age, but no effect of tinnitus, across all 5 groups. Separate tests revealed significant effects of age and tinnitus in the normal-hearing groups and hearing loss in adults with or without tinnitus, but no effect of tinnitus in those with hearing loss. CONCLUSION: DPOAE levels in the group of adults with hearing loss and tinnitus were diminished, but those in the group with normal hearing and tinnitus were enhanced, relative to DPOAE levels in the controls. Outer hair cell function, as indexed by DPOAEs, exhibits a complex association with tinnitus, and this has implications in the use of DPOAEs as a tool both for testing for tinnitus presence and for creating a model of neural mechanisms underlying tinnitus.

Henry JA, Roberts LE, Ellingson RM, Thielman EJ.
VA RR&D National Center for Rehabilitative Auditory Research, VA Medical Center, Portland, OR; Department of Otolaryngology, Oregon Health and Science University, Portland, OR.

Background: Psychoacoustic measures of tinnitus typically include loudness and pitch match, minimum masking level (MML), and residual inhibition (RI). We previously developed and documented a computer-automated tinnitus evaluation system (TES) capable of subject-guided loudness and pitch matching. The TES was further developed to conduct computer-aided, subject-guided testing for noise-band matching (NBM), MML, and RI. Purpose: The purpose of the present study was to document the capability of the upgraded TES to obtain measures of NBM, MML, and RI, and to determine the test-retest reliability of the responses obtained. Research Design: Three subject-guided, computer-automated testing protocols were developed to conduct NBM. For MML and RI testing, a 2-12 kHz band of noise was used. All testing was repeated during a second session. Study Sample: Subjects meeting study criteria were selected from those who had previously been tested for loudness and pitch matching in our laboratory. A total of 21 subjects completed testing, including seven females and 14 males. Results: The upgraded TES was found to be fairly time efficient. Subjects were generally reliable, both within and between sessions, with respect to the type of stimulus they chose as the best match to their tinnitus. Matching to bandwidth was more variable between measurements, with greater consistency seen for subjects reporting tonal tinnitus or wide-band noisy tinnitus than intermediate types. Between-session repeated MMLs were within 10 dB of each other for all but three of the subjects. Subjects who experienced RI during Session 1 tended to be those who experienced it during Session 2. Conclusions: This study may represent the first time that NBM, MML, and RI audiometric testing results have been obtained entirely through a self-contained, computer-automated system designed specifically for use in the clinic. Future plans include refinements to achieve greater testing efficiency. American Academy of Audiology.
Pulsatile tinnitus: imaging and differential diagnosis.
Hofmann E, Behr R, Neumann-Haefelin T, Schwager K.
Klinikum Fulda gAG, Departments of, Neuroradiology.

BACKGROUND: Pulsatile tinnitus, unlike idiopathic tinnitus, usually has a specific, identifiable cause. Nonetheless, uncertainty often arises in clinical practice about the findings to be sought and the strategy for work-up. METHODS: Selective literature review and evaluation of our own series of patients. RESULTS: Pulsatile tinnitus can have many causes. No prospective studies on this subject are available to date. Pulsatile tinnitus requires both a functional organ of hearing and a genuine, physical source of sound, which can, under certain conditions, even be objectified by an examiner. Pulsatile tinnitus can be classified by its site of generation as arterial, arteriovenous, or venous. Typical arterial causes are arteriosclerosis, dissection, and fibromuscular dysplasia. Common causes at the arteriovenous junction include arteriovenous fistulae and highly vascularized skull base tumors. Common venous causes are intracranial hypertension and, as predisposing factors, anomalies and normal variants of the basal veins and sinuses. In our own series of patients, pulsatile tinnitus was most often due to highly vascularized tumors of the temporal bone (16%), followed by venous normal variants and anomalies (14%) and vascular stenoses (9%). Dural arteriovenous fistulae, inflammatory hyperemia, and intracranial hypertension were tied for fourth place (8% each). CONCLUSION: The clinical findings and imaging studies must always be evaluated together. Thorough history-taking and clinical examination are the basis for the efficient use of imaging studies to reveal the cause of pulsatile tinnitus. Free PMC Article.

Evaluating psychoacoustic measures for establishing presence of tinnitus.
VA Medical Center (NCRAR), PO Box 1034, Portland, OR 97207. james.henry@va.gov.

The Department of Veterans Affairs (VA) considers tinnitus a disability. Veterans can claim tinnitus as a "service-connected" disability if the tinnitus is thought to be connected to military service. The VA adjudicates each claim and determines whether reasonable evidence exists to support it. Currently, determining the presence of tinnitus is based on subjective reporting-objective measures do not exist. The aim of this study was to develop and document a test for detecting the presence/absence of tinnitus with high confidence. Using our computer-automated, self-guided tinnitus evaluation system, we conducted three phases of testing to compare psychoacoustic measures of tinnitus between participants with versus without tinnitus. Phase 1 measures included loudness match, pitch match, minimum masking level, residual inhibition, Békésy, and forced-choice double staircase. Phases 2 and 3 measures were chosen based on results of the previous phase. The number of tests and time of testing decreased during each successive phase. Differences were seen between groups; most notably, higher low-frequency loudness matches and higher median pitch matches were observed for participants with tinnitus. Results of this study suggest that further efforts can produce a defined psychoacoustic test battery for identifying the presence/absence of tinnitus.
Can a new disease concept be developed using VEMP testing?

Seo, T.
Department of Otolaryngology, Kinki University, Faculty to Medicine, Japan.

Two decades have passed since the first publication of vestibular evoked myogenic potentials (VEMP). Now, cervical VEMP and ocular VEMP are accepted widely for the examination of the saccular organs and utricular organs, respectively. Can a new disease concept be developed using VEMP testing? In a previous study, it was reported that 6 out of 18 patients with undiagnosed dizziness showed abnormal cVEMP. Dizziness with a sensation of falling was related to the abnormal results. Another author study reported that 9 out of 10 subjects with lateral tilt sensation showed abnormal oVEMP. Thus, disequilibrium in the sagittal plane and horizontal plane is probably caused by otolith disorders and can be diagnosed only by VEMP testing. The lesion site of vestibular neuritis had been believed to be in the superior vestibular nerve. However, there are some reports about cases of acute-onset disequilibrium who showed inferior vestibular verve lesions. They showed abnormal cVEMP and normal results on caloric testing, thus the etiology was suggested to be inferior vestibular neuritis. The disease could be diagnosed only by VEMP testing. A positive result of diuretic-loading VEMP testing was observed in patients with Meniere’s disease; a positive result was also obtained in some cases without the typical symptoms of Meniere’s disease. They complained of recurrent tinnitus, aural fullness and severe disequilibrium or the sensation of falling downward or backward. The etiology was suggested to be saccular endolymphatic hydrops that could only be diagnosed by VEMP testing. As mentioned above, VEMP testing was useful to diagnose the etiology of disequilibrium caused by otolith dysfunction or superior vestibular nerve disorders. Therefore, the answer to the question, "Can new disease concept be developed using VEMP testing?" is "yes".

[To analyse the impact of tinnitus loudness and hearing loss on the life of tinnitus patient].
[Article in Chinese]

Yang J, Zhou H, Yang D.
Department of Otorhinolaryngology, the General Hospital of Tianjin Medical University, Tianjin, 300052, China.

OBJECTIVE: To analyse the impact of tinnitus loudness, tinnitus frequency, hearing loss, tinnitus subjective loudness on the life of tinnitus patient. METHOD: To inspect the 154 tinnitus patients with pure tone audiometry, tinnitus maching, tinnitus classification questionnaire and THI scale. This study applies THI scale to evaluate the impact of tinnitus on the life of tinnitus patient. Using statistical methods to analyse the relationship between tinnitus loudness, tinnitus frequency, hearing loss, tinnitus subjective loudness and the impact of tinnitus on the life of tinnitus patient. RESULT: (1) Tinnitus frequency is closed with the frequency of hearing loss. (2) There is no significant correlation between tinnitus loudness and the impact of tinnitus on the life of tinnitus patient. (3) There is no distinction between hearing loss and the THI scores. (4) The patient gets more scores in subgroup of THI with the increase of tinnitus subjective loudness classification. CONCLUSION: The impact of tinnitus loudness, hearing loss on the life of tinnitus patient is not very clearly, while the impact of tinnitus subjective loudness classification on the life of tinnitus patient is significant. In clinical, we can not evaluate the effect of the tinnitus treatment relying on tinnitus loudness and hearing loss simply. The finding provides us individual treatment to tinnitus patients.
Off-Frequency Listening in Subjects with Chronic Tinnitus.

Kiani F, Yoganantha U, Tan CM, Meddis R, Schaette R.

UCL Ear Institute, 332 Gray’s Inn Road, London WC1X 8EE, United Kingdom.

The occurrence of subjective tinnitus has been linked to cochlear damage, as most tinnitus patients have impaired hearing, and animal studies have shown that the induction of hearing loss can lead to behavioural signs of tinnitus. In tinnitus patients, the pure-tone audiogram is the main source of information about cochlear damage, but hearing thresholds alone may not adequately reflect its magnitude. Etchelecou et al. (2011) reported that the majority of patients with acute tinnitus post impulse noise exposure showed off-frequency listening (OFL), which is not readily observed in pure-tone audiograms. We investigated the possibility of OFL occurring in subjects with chronic tinnitus by testing twenty subjects who had experienced tinnitus for more than a year. OFL was assessed by measuring psychophysical tuning curves using a forward-masking paradigm. OFL occurred in 13 out of 20 subjects, 12 of whom also did not perceive frequencies above 8 kHz. Such unresponsive frequencies (UFs) were also present in three subjects without OFL. The tinnitus spectrum generally reached its highest values at the edge of or within the frequency regions with OFL or UFs, but there was no significant correlation between edge frequencies and the frequency with the highest tinnitus pitch similarity rating. When OFL and UFs were taken as evidence for cochlear dead regions, 16/20 subjects passed the criterion for cochlear dead regions. The remaining four subjects showed neither OFL nor UFs. © 2013 Published by Elsevier B.V.


Molander P, Nordqvist P, Oberg M, Lunner T, Lyxell B, Andersson G.

Department of Behavioural Sciences and Learning, Linnaeus Centre HEAD, Swedish Institute for Disability Research, Linköping University, Linköping, Sweden.

OBJECTIVES: For the last decade a host of different projects have been launched to allow persons who are concerned about their hearing status to quickly and at a low cost test their hearing ability. Most often, this is carried out without collecting complementary information that could be correlated with hearing impairment. In this two-part study we first, present the development and validation of a novel Internet-based hearing test, and second, report on the associations between this test and phonological representation, quality of life and self-reported hearing difficulties. DESIGN: Cross-sectional study. SETTING: An opportunity sample of participants was recruited at the Stockholm central station for the first study. All parts of the second study were conducted via the Internet, with testing and self-report forms adapted for online use. PARTICIPANTS: The first part of the study was carried out in direct contact with the participants, and participants from the second study were recruited by means of advertisements in newspapers and on webpages. The only exclusion criterion was that participants had to be over 18 years old. Most participants were between 60 and 69 years old. There were almost an equal number of men and women (total n=316). OUTCOME MEASURES: 48 participants failed the Internet-based hearing screening test. The group failing the test reported more problems on the Amsterdam Inventory of Auditory Disability. In addition, they were found to have diminished phonological representational skills. However, no difference in quality of life was found. CONCLUSIONS: Almost one in five participants was in need of contacting their local hearing clinic. This group had more complaints regarding tinnitus and hyperacusis, rated their own hearing as worse than those who passed, and had a poorer capability of generating accurate phonological representations. This study suggests that it is feasible to screen for hearing status online, and obtain valid data. Free PMC Article.
Diagnostic utility of magnetic resonance imaging and magnetic resonance angiography in the radiological evaluation of pulsatile tinnitus.
Am J Otolaryngol. 2013 Sep 13. doi:pii: S0196-0709(13)00192-0. 10.1016/j.amjoto.2013.08.001. [Epub ahead of print]

Shweel M, Hamdy B.
Department of Radiology, Minia University Hospital, Al-Minia, Egypt.

AIM: Our aim was to assess the diagnostic utility of magnetic resonance imaging with complimentary magnetic resonance angiography (MRI/MRA) in the radiological evaluation of patients with pulsatile tinnitus (PT). MATERIALS AND METHODS: The present study was retrospectively conducted on 27 patients with pulsatile tinnitus. All patients showed normal otoscopic findings and were evaluated with magnetic resonance imaging (MRI) with complimentary magnetic resonance angiography (MRA), 9/27 (33.3%) patients were investigated by CT, and 12/27 (44.4%) were evaluated by angiography. All patients' clinical investigation was reviewed to discard systemic causes of PT. RESULTS: All hard copies of MRI/MRA studies were evaluated. MRI/MRA detected the underlying etiology of subjective pulsatile tinnitus (PT) in 11/27 patients (40.7%), and 16/27 patients (59.5%) showed normal MRI/MRA examination. The most common cause was dural arteriovenous malformation (AFM) in 4/27 (14.8%) patients, high jugular bulbus in 2/27 (7.4%), aneurysm of internal carotid artery in 1/27 (3.7%), aberrant internal carotid artery in 1/27 (3.7%), vertebral artery hypoplasia in 2/27 (7.4%), and glomus tumor in 1/27 (3.7%). The statistical results of the present study showed that MRI/MRA had the following: 80% sensitivity, 88% specificity, 86% accuracy, 85% PPV, 83% NPV, and 15% error percentage for diagnosis of PT. CONCLUSION: MRI/MRA was an effective radiological imaging method in detecting the underlying pathology of pulsatile tinnitus. Magnetic resonance may be considered a first line diagnostic imaging modality in the assessment of subjective pulsatile tinnitus.

Autonomic conditions in tinnitus and implications for korean medicine.

Choi EJ, Yun Y, Yoo S, Kim KS, Park JS, Choi I.

Department of Otorhinolaryngology of Korean Medicine, Kyung Hee University Hospital at Gangdong, Seoul, Republic of Korea.

Tinnitus patients suffer from not only auditory sensations but also physical, mental, and social difficulties. Even though tinnitus is believed to be associated with the autonomic nervous system, changes in autonomic conditions in tinnitus patients are not receiving much research attention. The aims of this study were to investigate the autonomic condition of tinnitus patients and to consider Korean medicine in the treatment of tinnitus with an evidence-based approach. We performed a retrospective chart review and compared the heart rate variability (HRV) parameters of 40 tinnitus patients (19 acute and 21 chronic) and 40 healthy controls. In tinnitus patients, the power of the high frequency component and total power of the HRV significantly decreased (P < 0.05), and the low frequency to high frequency ratio significantly increased (P < 0.05). There was no significant difference between the acute and chronic patients. When comparing each group with the controls, there was a tendency that the longer the duration of tinnitus was, the larger the observed HRV change was. In conclusion, tinnitus patients have vagal withdrawal and sympathetic overactivity, and chronic tinnitus more strongly affects autonomic conditions than acute tinnitus. This study provides evidence for Korean medical treatments of tinnitus, such as acupuncture and Qi-training, that cause modulation of cardiac autonomic function. Free PMC Article.
Design and implementation of a biomedical equipment for the detection objective Tinnitus in patients with this diseases (Conference Paper).

Pan American Health Care Exchanges, PAHCE, 2013, Article number 6568220
8th Pan American Health Care Exchanges Conference, PAHCE 2013; Medellin; Colombia; 29 April 2013 through 4 May 2013; Category numberCFP1318G-PRT; Code 99384.

Robles, H.V.\textsuperscript{a}, Aldonate, J.A.\textsuperscript{b}, Vergara, R.\textsuperscript{a}
\textsuperscript{a} Facultad de Ingeniería, Ingeniería Biomédica ECCI y GINIC-HUS, Bogotá, Colombia.
\textsuperscript{b} Facultad de Ingeniería UNER y LIRINS, Oro Verde, Entre Ríos, Argentina.

Today millions of people suffer from a condition called Tinnitus or tinnitus described as enigmatic in the literature due to the lack of clinical diagnostic tools. To date, there are many diagnostic methods for determining the psychoacoustic characteristics of the disease, none have been merely when definitive diagnosis of a lens, on the contrary depends largely on the patient's description, making diagnosis and subjective clinical unreliability having no actual physical record of it. Therefore, it was decided to test the hypothesis proposed by Dr. Ramiro Vergara, which states that all have a sound source Tinnitus real, and design and implement a biomedical equipment capable of capturing the sound signals generated in the ear of patients with this Acufenómetro condition called Objective. The main purpose of this paper is to show the development of the computer tool designed for the objective determination of Tinnitus and laboratory testing and in patients who demonstrate the veracity of the claims of the hypothesis of Dr. Vergara. © 2013 IEEE.

Persistent petrosquamosal sinus in adults: qualitative imaging evaluation on high-resolution CT venography.

Department of Radiology, Beijing Tongren Hospital, Capital Medical University, Beijing, PR China.

BACKGROUND: The persistent petrosquamosal sinus (PSS) is usually overlooked before or during otological surgeries, which may cause misdiagnosis or iatrogenic bleedings. Imaging characteristics have not been well summarized for PSS, especially for large consecutive cases. PURPOSE: To analyze the characteristics of PSS on high-resolution CT venography (HRCTV) in order to improve imaging diagnostic accuracy as well as to assist clinical management. MATERIAL AND METHODS: Five hundred and thirty-two consecutive patients with pulsatile tinnitus who underwent CT angiography and venography examinations in the last 4 years were reviewed. Thirty patients with PSS in 39 temporal bones (TBs) were identified by two radiologists' consensus. The characteristics of PSS were analyzed according to its embryological variations. Different types of PSS were divided according to the origin and course, respectively. RESULTS: The average diameter of the PSS was 1.4 mm. Twenty-nine TBs (74%) had PSS origin from the dorsolateral surface of the transverse sinus before its junction with the superior petrosal sinus (Position A); three TBs (8%) had PSS origin from the ventroinferior surface of the transverse sinus after or before the junction (Position B or C); seven TBs (18%) had PSS without definite origin (Position D). Eighteen TBs (46%) had PSS course in a lateral bony canal/groove (lateral canal type); 15 TBs (38%) had PSS course in petrosquamosal fissure (PSF) (PSF type); six TBs (15%) had PSS course in both (lateral canal/PSF type). For other imaging findings, a branch entering the cranial part of PSS was identified in 10 TBs (26%); a vascular mass was formed in five TBs (13%); focal defect of bony wall was observed in seven TBs (18%). A postglenoid foramen (PGF) was detected in 25 TBs (64%). CONCLUSION: HRCTV can mostly identify the characteristics of PSS similar to its anatomic findings and the optimal imaging technique has the potential to improve its clinical management.
Effectiveness of the Combined Hearing and Masking Devices on the Severity and Perception of Tinnitus: A Randomized, Controlled, Double-Blind Study.

Oz I, Arslan F, Hizal E, Erbek SH, Eryaman E, Senkal OA, Ogurlu T, Kizildag AE, Ozluoglu LN.
Department of ENT Surgery, Faculty of Medicine, Baskent University, Ankara, Turkey.

Objective: The aim of this study was to evaluate the effect of combined hearing and tinnitus masking devices that are appropriately programmed for acoustic stimulations using wide-band noise over the specific frequency range of tinnitus. Material and Methods: A total of 21 patients were randomly divided into 2 groups. Group I (12 patients) was managed with betahistine dihydrochloride (2HCl) and fitted either with a combined hearing aid or a sound generator, and group II (9 patients) was treated with betahistine 2HCl for 3 months. Audiological tests, pitch matching to determine the frequency of tinnitus, an assessment of tinnitus severity, and subjective scores (visual analog scale, VAS; Mini-Tinnitus Questionnaire) were used to assess the patients in both groups, and a loudness scale was also analyzed in group I. The results were evaluated in a double-blinded manner. Results: Significant decreases in the severity of tinnitus, Mini-Tinnitus Questionnaire score and VAS were observed in both groups. No significant differences were obtained in pitch-matched frequency of tinnitus in the two groups. Conclusion: The findings obtained using either the combined devices or the masking devices with wide-band masking demonstrate that these devices are an effective tinnitus treatment alternative. Copyright © 2013 S. Karger AG, Basel.

Do cortical gamma oscillations promote or suppress perception? An under-asked question with an over-assumed answer.

Sedley W, Cunningham MO.
Institute of Neuroscience, Faculty of Medical Sciences, Newcastle University Medical School Newcastle Upon Tyne, UK.

Cortical gamma oscillations occur alongside perceptual processes, and in proportion to perceptual salience. They have a number of properties that make them ideal candidates to explain perception, including incorporating synchronized discharges of neural assemblies, and their emergence over a fast timescale consistent with that of perception. These observations have led to widespread assumptions that gamma oscillations' role is to cause or facilitate conscious perception (i.e., a "positive" role). While the majority of the human literature on gamma oscillations is consistent with this interpretation, many or most of these studies could equally be interpreted as showing a suppressive or inhibitory (i.e., "negative") role. For example, presenting a stimulus and recording a response of increased gamma oscillations would only suggest a role for gamma oscillations in the representation of that stimulus, and would not specify what that role were; if gamma oscillations were inhibitory, then they would become selectively activated in response to the stimulus they acted to inhibit. In this review, we consider two classes of gamma oscillations: "broadband" and "narrowband," which have very different properties (and likely roles). We first discuss studies on gamma oscillations that are non-discriminatory, with respect to the role of gamma oscillations, followed by studies that specifically support specifically a positive or negative role. These include work on perception in healthy individuals, and in the pathological contexts of phantom perception and epilepsy. Reference is based as much as possible on magnetoencephalography (MEG) and electroencephalography (EEG) studies, but we also consider evidence from invasive recordings in humans and other animals. Attempts are made to reconcile findings within a common framework. We conclude with a summary of the pertinent questions that remain unanswered, and suggest how future studies might address these. Free PMC Article.
Brain regions responsible for tinnitus distress and loudness: a resting-state FMRI study.

Department of Anatomy and Cell Biology, Graduate School of Wakayama Medical University, Wakayama, Japan.

Subjective tinnitus is characterized by the perception of phantom sound without an external auditory stimulus. We hypothesized that abnormal functionally connected regions in the central nervous system might underlie the pathophysiology of chronic subjective tinnitus. Statistical significance of functional connectivity (FC) strength is affected by the regional autocorrelation coefficient (AC). In this study, we used resting-state functional MRI (fMRI) and measured regional mean FC strength (mean cross-correlation coefficient between a region and all other regions without taking into account the effect of AC (rGC) and with taking into account the effect of AC (rGCa) to elucidate brain regions related to tinnitus symptoms such as distress, depression and loudness. Consistent with previous studies, tinnitus loudness was not related to tinnitus-related distress and depressive state. Although both rGC and rGCa revealed similar brain regions where the values showed a statistically significant relationship with tinnitus-related symptoms, the regions for rGCa were more localized and more clearly delineated the regions related specifically to each symptom. The rGCa values in the bilateral rectus gyri were positively correlated and those in the bilateral anterior and middle cingulate gyri were negatively correlated with distress and depressive state. The rGCa values in the bilateral thalamus, the bilateral hippocampus, and the left caudate were positively correlated and those in the left medial superior frontal gyrus and the left posterior cingulate gyrus were negatively correlated with tinnitus loudness. These results suggest that distinct brain regions are responsible for tinnitus symptoms. The regions for distress and depressive state are known to be related to depression, while the regions for tinnitus loudness are known to be related to the default mode network and integration of multi-sensory information. Free PMC Article.

Central auditory processing during chronic tinnitus as indexed by topographical maps of the mismatch negativity obtained with the multi-feature paradigm.

Department of Otorhinolaryngology, Hannover Medical University (MHH), Hannover, Germany; ENT and Head & Neck Research Center, Iran University of Medical Sciences (IUMS), Tehran, Iran. Electronic address: mahmoudian.saeid@mh-hannover.de.

This study aimed to compare the neural correlates of acoustic stimulus representation in the auditory sensory memory on an automatic basis between tinnitus subjects and normal hearing (NH) controls, using topographical maps of the MMNs obtained with the multi-feature paradigm. A new and faster paradigm was adopted to look for differences between 2 groups of subjects. Twenty-eight subjects with chronic subjective idiopathic tinnitus and 33 matched healthy controls were included in the study. Brain electrical activity mapping of multi-feature MMN paradigm was recorded from 32 surface scalp electrodes. Three MMN parameters for five deviants consisting frequency, intensity, duration, location and silent gap were compared between the two groups. The MMN amplitude, latency and area under the curve over a region of interest comprising: F3, F4, Fz, FC3, FC4, FCz, and Cz were computed to provide better signal to noise ratio. These three measures could differentiate the cognitive processing disturbances in tinnitus sufferers. The MMN topographic maps revealed significant differences in amplitude and area under the curve for frequency, duration and silent gap deviants in tinnitus subjects compared to NH controls. The current study provides electrophysiological evidence supporting the theory that the pre-attentive and automatic central auditory processing is impaired in individuals with chronic tinnitus. Considering the advantages offered by the MMN paradigm used here, these data might be a useful reference point for the assessment of sensory memory in tinnitus patients and it can be applied with reliability and success in treatment monitoring. Copyright © 2013 Elsevier B.V. All rights reserved.

29
Cortical activity in tinnitus patients and its modification by phonostimulation.

Balance System Collegium Medicum, Department of Pathophysiology of Hearing, Nicolaus Copernicus University, Bydgoszcz, Poland.

OBJECTIVE: The goal of this study was to observe spontaneous cortical activity and cortical activity modulated by tinnitus-matched sound in tinnitus patients and healthy subjects with no otoneurologic symptoms. METHOD: Data were prospectively collected from 50 tinnitus patients and 25 healthy subjects. Cortical activity was recorded in all subjects with eyes closed and open and during photostimulation, hyperventilation and acoustic stimulation using 19-channel quantitative electroencephalography. The sound applied in the tinnitus patients was individually matched with the ability to mask or equal the tinnitus. The maximal and mean amplitude of the delta, theta, alpha and beta waves and the type and amount of the pathologic EEG patterns were noted during each recording. Differences in cortical localization and the influence of sound stimuli on spontaneous cortical activity were evaluated between the groups. RESULTS: The tinnitus group exhibited decreased delta activity and increased alpha and beta activity. Hyperventilation increased the intensity of the differences. The tinnitus patients had more sharp-slow waves and increased slow wave amplitude. Sound stimuli modified the EEG recordings; the delta and beta wave amplitudes were increased, whereas the alpha-1 wave amplitude was decreased. CONCLUSION: Cortical activity in the tinnitus patients clearly differed from that in healthy subjects, i.e., tinnitus is not a "phantom" sign. The changes in cortical activity included decreased delta wave amplitudes, increased alpha-1, beta-1 and beta-h wave amplitudes and pathologic patterns. Cortical activity modifications occurred predominantly in the temporal region. Acoustic stimulation affected spontaneous cortical activity only in tinnitus patients, and although the applied sound was individually matched, the pathologic changes were only slightly improved. Free PMC Article.

Using resting state functional connectivity to unravel networks of tinnitus.

Husain FT, Schmidt SA.
Department of Speech and Hearing Science, University of Illinois at Urbana-Champaign, Champaign, Illinois, USA; Neuroscience Program, University of Illinois at Urbana-Champaign, Champaign, Illinois, USA; Beckman Institute for Advanced Science and Technology, University of Illinois at Urbana-Champaign, Champaign, Illinois, USA. Electronic address: husainf@illinois.edu.

Resting state functional connectivity (rs-fc) using fMRI has become an important tool in examining differences in brain activity between patient and healthy populations. Studies employing rs-fc have successfully identified altered intrinsic neural networks in many neurological and psychiatric disorders, including Alzheimer's disease, schizophrenia, and more recently, tinnitus. The neural mechanisms of subjective tinnitus, defined as the perception of sound without an external source, are not well understood. Several inherent networks have been implicated in tinnitus; these include default mode, auditory, dorsal attention, and visual resting-state networks. Evidence from several studies has begun to suggest that tinnitus causes consistent modifications to these networks, including greater connectivity between limbic areas and cortical networks not traditionally involved with emotion processing, and increased connectivity between attention and auditory processing brain regions. Such consistent changes to these networks may allow for the identification of objective brain imaging measures of tinnitus, leading to a better understanding of the neural basis of the disorder. Further, examination of rs-fc allows us to correlate behavioral measures, such as tinnitus severity and comorbid factors including hearing loss, with specific intrinsic networks. © 2013 Published by Elsevier B.V.
Reversing pathologically increased EEG power by acoustic coordinated reset neuromodulation.

Adamchic I, Toth T, Hauptmann C, Tass PA.
Institute of Neuroscience and Medicine-Neuromodulation (INM-7), Jülich Research Center, Jülich, Germany.

Acoustic Coordinated Reset (CR) neuromodulation is a patterned stimulation with tones adjusted to the patient's dominant tinnitus frequency, which aims at desynchronizing pathological neuronal synchronization. In a recent proof-of-concept study, CR therapy, delivered 4-6 h/day more than 12 weeks, induced a significant clinical improvement along with a significant long-lasting decrease of pathological oscillatory power in the low frequency as well as γ band and an increase of the α power in a network of tinnitus-related brain areas. As yet, it remains unclear whether CR shifts the brain activity toward physiological levels or whether it induces clinically beneficial, but nonetheless abnormal electroencephalographic (EEG) patterns, for example excessively decreased δ and/or γ. Here, we compared the patients' spontaneous EEG data at baseline as well as after 12 weeks of CR therapy with the spontaneous EEG of healthy controls by means of Brain Electrical Source Analysis source montage and standardized low-resolution brain electromagnetic tomography techniques. The relationship between changes in EEG power and clinical scores was investigated using a partial least squares approach. In this way, we show that acoustic CR neuromodulation leads to a normalization of the oscillatory power in the tinnitus-related network of brain areas, most prominently in temporal regions. A positive association was found between the changes in tinnitus severity and the normalization of δ and γ power in the temporal, parietal, and cingulate cortical regions. Our findings demonstrate a widespread CR-induced normalization of EEG power, significantly associated with a reduction of tinnitus severity. Hum Brain Mapp, 2013. © 2013 Wiley Periodicals, Inc.


Schmidt SA, Akrofi K, Carpenter-Thompson JR, Husain FT.
Neuroscience Program, University of Illinois Urbana-Champaign, Champaign, Illinois, United States of America.

We investigated auditory, dorsal attention, and default mode networks in adults with tinnitus and hearing loss in a resting state functional connectivity study. Data were obtained using continuous functional magnetic resonance imaging (fMRI) while the participants were at "rest" and were not performing any task. Participants belonged to one of three groups: middle-aged adults with tinnitus and mild-to-moderate high frequency hearing loss (TIN), age-matched controls with normal hearing and no tinnitus (NH), and a second control group with mild-to-moderate high frequency hearing loss without tinnitus (HL). After standard preprocessing, (a) a group independent component analysis (ICA) using 30 components and (b) a seeding-based connectivity analysis were conducted. In the group ICA, the default mode network was the only network to display visual differences between subject groups. In the seeding analysis, we found increased connectivity between the left parahippocampus and the auditory resting state network in the TIN group when compared to NH controls. Similarly, there was also an increased correlation between the right parahippocampus and the dorsal attention network when compared to HL controls. Other group differences in this attention network included decreased correlations between the seed regions and the right supramarginal gyrus in TIN patients when compared to HL controls. In the default mode network, there was a strong decrease in correlation between the seed regions and the precuneus when compared to both control groups. The findings of this study identify specific alterations in the connectivity of the default mode, dorsal attention, and auditory resting state networks due to tinnitus. The results suggest that therapies for tinnitus that mitigate the increased connectivity of limbic regions with auditory and attention resting state networks and the decreased coherence of the default mode network could be effective at reducing tinnitus-related distress. Free Article.
Prognostic factors of profound idiopathic sudden sensorineural hearing loss.
Eur Arch Otorhinolaryngol. 2013 Jun 15. [Epub ahead of print]

Wen YH, Chen PR, Wu HP.

Department of Otolaryngology, Buddhist Tzu Chi General Hospital, No. 707, Sec. 3, Chung Yang Rd., Hualien, 970, Taiwan (ROC).

Profound idiopathic sudden sensorineural hearing loss is thought to have a poor prognosis, but few studies have focused on this condition. We aimed to assess the impact of patient factors, audiologic parameters, and salvage intratympanic steroid injection therapy on the prognosis of profound idiopathic sudden sensorineural hearing loss. The demographic, clinical, and audiologic data, degree of hearing recovery, and efficacy of intratympanic steroid injection therapy in 576 patients with profound idiopathic sudden sensorineural hearing loss (mean age 56.2 ± 14.9 years) who had been admitted at four tertiary referral centers between 2000 and 2011 were retrospectively reviewed. The mean hearing level at the initial presentation was 108.1 ± 9.5 dB. Many patients experienced vertigo (52.1 %) and tinnitus (77.4 %). At the 2-month follow-up, 172 (29.8 %) patients showed some degree of hearing recovery, but only 21 (3.6 %) patients recovered normal hearing. Further, the 116 patients who had received salvage intratympanic steroid injections showed a better audiologic outcome (improvement, 26.1 ± 24.3 vs. 15.7 ± 22.1 dB; P = 0.000) than those who had not (n = 429). In conclusion, a higher degree of hearing loss at the initial presentation indicates a poorer prognosis. Salvage intratympanic steroid injection therapy may improve the hearing of patients with profound idiopathic sudden sensorineural hearing loss after the failure of systemic steroid therapy.

Steroids for idiopathic sudden sensorineural hearing loss.
Cochrane Database Syst Rev. 2013 Jul 2;7:CD003998. [Epub ahead of print]

Wei BP, Stathopoulos D, O'Leary S.

Department of Otolaryngology, Royal Victorian Eye and Ear Hospital/University of Melbourne, 32 Gisborne Street, Melbourne, Victoria 3002, Australia.

BACKGROUND: This is an update of a Cochrane review first published in The Cochrane Library in Issue 1, 2006 and previously updated in 2009. Idiopathic sudden sensorineural hearing loss (ISSHL) is a clinical diagnosis characterised by a sudden deafness of cochlear or retrocochlear origin in the absence of a clear precipitating cause. Steroids are commonly prescribed to treat this condition. There is no consensus on their effectiveness. OBJECTIVES: To determine whether steroids in the treatment of ISSHL a) improve hearing (primary) and b) reduce tinnitus (secondary). To determine the incidence of significant side effects from the medication. SEARCH METHODS: We searched the Cochrane Ear, Nose and Throat Disorders Group Trials Register; the Cochrane Central Register of Controlled Trials (CENTRAL); PubMed; EMBASE; CINAHL; Web of Science; Cambridge Scientific Abstracts; ICTRP and additional sources for published and unpublished trials. The date of the most recent search was 22 April 2013. SELECTION CRITERIA: We identified all randomised controlled trials (with or without blinding) in which steroids were evaluated in comparison with either no treatment or a placebo. We considered trials including the use of steroids in combination with another treatment if the comparison control group also received the same other treatment. The two authors reviewed the full-text articles of all the retrieved trials of possible relevance and applied the inclusion criteria independently. DATA COLLECTION AND ANALYSIS: We graded trials for risk of bias using the Cochrane approach. The data extraction was performed in a standardised manner by one author and rechecked by the other author. Where necessary we contacted investigators to obtain the missing information. Meta-analysis was neither possible nor considered appropriate because of the heterogeneity of the populations studied and the differences in steroid formulations, dosages and duration of treatment. We analysed and reported the quality of the results of each study individually. A narrative overview of the results is presented. MAIN RESULTS: Only three trials, involving 267 participants, satisfied the inclusion
criteria and all three studies were at high risk of bias. One trial showed a lack of effect of oral steroids in improving hearing compared with the placebo control group. The second trial showed a significant improvement of hearing in 61% of the patients receiving oral steroid and in only 32% of the patients from the control group (combination of placebo-treated group and untreated control group). The third trial also showed a lack of effect of oral steroids in improving hearing compared with the placebo control. However, this trial did not follow strict inclusion criteria for participant selection and analysis of data was limited by significant exclusion of participants from the final analysis and lack of participant compliance to the treatment protocol. No clear evidence was presented in two trials about any harmful side effects of the steroids. Only one study declared that no patients suffered from adverse effects of the steroid treatment. AUTHORS’ CONCLUSIONS: The value of steroids in the treatment of idiopathic sudden sensorineural hearing loss remains unclear since the evidence obtained from randomised controlled trials is contradictory in outcome, in part because the studies are based upon too small a number of patients.

**Vitamin B12 levels in patients with tinnitus and effectiveness of vitamin B12 treatment on hearing threshold and tinnitus.**


**Berkiten G, Yildirim G, Topaloglu I, Ugras H.**

ENT Department, Okmeydani Teaching Hospital, Sişli, Istanbul, Turkey. gulerberkiten@gmail.com.

OBJECTIVES: The aim of this study was to determine vitamin B12 levels in patients with non-pulsatile tinnitus and to assess the efficacy of replacement treatment in tinnitus and hearing in patients with vitamin B12 deficiency. MATERIALS AND METHODS: We assessed 100 patients (mean age, 43.87, SD 10.12; 62 females, 38 males) and 20 healthy volunteers (9 females, 11 males). Patients whose blood serum vitamin B12 levels were below 180 pg/mL were deemed to be vitamin B12-deficient. The effect of vitamin B12 replacement treatment on hearing was examined using audiometric tests between 250 and 20000 Hz, and we compared results with a visual analogue scale (VAS) before and after treatment, which helped to produce an objective assessment of the therapeutic results in tinnitus. RESULTS: Tinnitus was found to be unilateral in 57% of cases (the right ear in 56% and the left ear in 44% of these cases) and bilateral in 43% of cases. Of the patients with tinnitus, 63 had low B12 vitamin levels, and 37 had normal B12 vitamin levels. No statistically significant difference was found with the control group levels (p = 0.80, odds ratio = 1.13). No significant change was observed in tinnitus severity after vitamin B12 therapy. Eight of these patients reported some relief in tinnitus on the VAS, but the rate of improvement was not significant (p > 0.05). In the tinnitus patients with low B12 vitamin levels, audiometric tests conducted after B12 vitamin treatment revealed a significant improvement in hearing levels only at the 250 Hz frequency. No change was observed at other frequencies. CONCLUSION: B12 replacement treatment was not effective in these patients with tinnitus. Some patients improved following vitamin B12 supplementation but the results were not significant. More studies are needed to find the reasons for, and effective treatment of, tinnitus since the aetiology of subjective tinnitus is highly variable.
[Treatment of hyperlipidemia by xiaozhi capsule: a clinical efficacy research].
[Article in Chinese]

Institute of Sores Ulceration, Tianjin Academy of Traditional Chinese Medicine, Tianjin 300120, China.

OBJECTIVE: To observe the clinical effect and efficacy of Xiaozhi Capsule (XZC), a Chinese medicine preparation for tonifying Gan-Shen, invigorating Pi to dissipate dampness (TGSIPDD) on total cholesterol (TC), triglyceride (TG), high-density lipoprotein cholesterol (HDL-C), low-density lipoprotein cholesterol (LDL-C), and endothelin (ET) in treating patients with hyperlipidemia. METHODS: Totally 120 primary hyperlipidemia patients were randomly assigned to the treatment group (80 cases) and the control group (40 cases). Those in the treatment group took XZC, while those in the control group took Xuezhikang Capsule (XZKC). The serum TC, TG, HDL-C, LDL-C, and ET were detected and evaluated after 8 weeks of treatment. RESULTS: In the treatment group TC was reduced by 25.60%, TG by 33.70%, LDL-C by 32.90%, and ET by 11.02%, while HDL-C was elevated by 24.20%. In the control group, TC was reduced by 24.80%, TG by 33.50%, LDL-C by 31.30%, and ET by 12.05%, while HDL-C was elevated by 20.90%. There was statistical difference in the two groups when compared with before treatment (P < 0.01). But there was no statistical difference in the aforesaid indices between the two groups after treatment (P > 0.05). The integrals for main symptoms after treatment obviously decreased in the two groups, showing statistical difference when compared with before treatment in the same group (P < 0.01). But there was no statistical difference in the aforesaid indices between the two groups (P > 0.05). After 8 weeks of treatment, symptoms such as vertigo, heavy sensation of head, palpitation, chest distress, dry mouth and thirsty were obviously improved after treatment. There was statistical difference in the improvement of tinnitus after treatment in the treatment group (P < 0.01). The total effective rate was 86.25% in the treatment group and 82.50% in the control group, showing no statistical difference (P > 0.05). CONCLUSIONS: XZC showed certain effects on each blood lipid index and ET of hyperlipidemia patients. It had better improvement of clinical symptoms with reliable efficacy.

[Multi-center study on the treatment of sudden total deafness].
Zhonghua Er Bi Yan Hou Tou Jing Wai Ke Za Zhi. 2013 May;48(5):379-84.

Department of Otolaryngology Head and Neck Surgery, West China Hospital of Sichuan University, Chengdu, China. hxzhengh@126.com.

OBJECTIVE: To assess the results of drug therapy in patients with severe idiopathic sudden sensorineural hearing loss (ISSHL) with total frequency hearing loss. METHODS: A prospective randomized, single blind, multi-center clinical trial was designed. The untreated patients with ISSHL were included, who had severe hearing loss (pure tone audiometry showed patients had total frequency hearing loss, and their mean auditory threshold of 500, 1000, 2000, 4000 Hz was beyond 81 dB HL), age between 18 to 65 years old, and within 14 days of the onset . The patients were divided into one of the four drug groups [batroxobin, batroxobin + ginkgo biloba leaves extract (EGb), batroxobin + EGb + glucocorticoids, EGb + glucocorticoids] according to the random table, and receive treatment. RESULTS: Totally 276 patients with unilateral severe ISSHL were included from 33 hospitals, from August 2007 to October 2011. Among them, male patients accounted for 135 (48.91%), female 141 (51.09%); the average age was (41.7 ± 13.3)years. Forty cases were recovered (14.49%), 78 cases had marked effective (28.26%), 76 cases were effective (27.54%), 82 cases were in-effective (29.71%), and the total effective rate was 70.29%. Among four drug groups, the separate effective rate were 73.33%, 61.43%, 78.31% and 67.95% respectively, no significant difference was found between groups (χ²(2) = 9.97, P = 0.62). Among the four groups, the separate cure rate for hearing loss were 11.11%, 12.86%, 16.87% and 15.38%, the glucocorticoid groups were significantly better than those not used. Among severe sudden deafness patients, 92.39% cases accompanied with
tinnitus, 44.93% with dizziness (or vertigo), 50.36% with ear stuffy. There had no significant difference between the four groups with accompanied symptoms (all P > 0.05). CONCLUSIONS: It is value to give active treatment to sever sudden deafness patients because of an effective rate of 70%. However, the doctors and patients should be mind of a cure rate of only 14%. Steroids are recommended because it may play a role in the improvement rate.

[Multi-center study on the treatment for intermediate and high-frequency sudden sensorineural hearing loss].
[Article in Chinese]
Zhonghua Er Bi Yan Tou Jing Wai Ke Za Zhi. 2013 May;48(5):368-73.


Department of Otorhinolaryngology Head and Neck Surgery, Shandong Provincial Hospital Group EENT Hospital, Ji'nan, China.

OBJECTIVE: To analyze the therapeutic effect of treatment for intermediate and high-frequency sudden sensorineural hearing loss (SSNHL). METHODS: A prospective clinical multicentre research was conducted using international standardized approach of clinical research. SSNHL Cases with intermediate and high-frequency hearing loss, that accepted no medication from onset of hearing loss within two weeks duration and ages ranged between 18 and 65, were collected. All patients were treated by one of four treatments plans chosen by unified random table. RESULTS: 141 patients with intermediate and high-frequency SSNHL were recruited in the research. Twenty subjects were treated with lidocaine, 21 cases with lidocaine and hormone, 40 cases with Ginaton, and 60 cases with Ginaton and hormone. 42 out of 141 (29.79%) patients were total recovery, 24 (17.02%) achieved excellent recovery, 27 (19.15%) achieved partial recovery, and 48 (34.04%) were ineffective. The total effective rate was 65.96%. In lidocaine group, the total effective rate was 55.00%, 66.67% in lidocaine and hormone group, 67.50% in Ginaton group, and 68.33% in Ginaton and hormone group. Considering the total effective rate, there was no statistical difference between four groups (P > 0.05). However, the recovery rate in Ginaton group was significant difference comparing with that in lidocaine group (P = 0.0496). 119 had concomitant symptom of tinnitus, and the tinnitus was improved in patients of 81.51%. With regard to total effective rate of tinnitus in four treatment groups, it was 57.89% (11/19) in lidocaine group, 100.00% (18/18) in lidocaine and hormone group, 88.57% (31/35) in Ginaton group, 78.72% (37/47) in Ginaton and hormone group. There was significant ascendancy in lidocaine and hormone group versus that in lidocaine group (P = 0.002) and Ginaton and hormone group (P = 0.029). And the difference between lidocaine and Ginaton groups was statistical significance (χ² = 6.705, P < 0.05). In 43 patients with muffled symptom in aural region, 90.70% was partial recovery. There was no statistical difference between each groups (χ² = 5.97, P = 0.74). There were 17 with dizziness or vertigo improved in all cases. Another 10 patients accompanied other complaints all improved. CONCLUSIONS: for the treat of intermediate and high-frequency SSNHL, the therapeutic effect in hearing has no significantly different between single and combined drug therapies. Considering the recovery rate, there is an obvious advantage in Ginaton group compared with lidocaine group. Tinnitus is the major concomitant symptom in intermediate and high-frequency SSNHL, and lidocaine and hormone therapy should be used.
VI Auditive Stimulation

Reversing pathologically increased EEG power by acoustic coordinated reset neuromodulation.

Adamchic I, Toth T, Hauptmann C, Tass PA.
Institute of Neuroscience and Medicine-Neuromodulation (INM-7), Jülich Research Center, Jülich, Germany.

Acoustic Coordinated Reset (CR) neuromodulation is a patterned stimulation with tones adjusted to the patient’s dominant tinnitus frequency, which aims at desynchronizing pathological neuronal synchronization. In a recent proof-of-concept study, CR therapy, delivered 4-6 h/day more than 12 weeks, induced a significant clinical improvement along with a significant long-lasting decrease of pathological oscillatory power in the low frequency as well as γ band and an increase of the α power in a network of tinnitus-related brain areas. As yet, it remains unclear whether CR shifts the brain activity toward physiological levels or whether it induces clinically beneficial, but nonetheless abnormal electroencephalographic (EEG) patterns, for example excessively decreased δ and/or γ. Here, we compared the patients’ spontaneous EEG data at baseline as well as after 12 weeks of CR therapy with the spontaneous EEG of healthy controls by means of Brain Electrical Source Analysis source montage and standardized low-resolution brain electromagnetic tomography techniques. The relationship between changes in EEG power and clinical scores was investigated using a partial least squares approach. In this way, we show that acoustic CR neuromodulation leads to a normalization of the oscillatory power in the tinnitus-related network of brain areas, most prominently in temporal regions. A positive association was found between the changes in tinnitus severity and the normalization of δ and γ power in the temporal, parietal, and cingulate cortical regions. Our findings demonstrate a widespread CR-induced normalization of EEG power, significantly associated with a reduction of tinnitus severity. Hum Brain Mapp, 2013. © 2013 Wiley Periodicals, Inc.

Evaluation of the acoustic coordinated reset (CR ®) neuromodulation therapy for tinnitus: study protocol for a double-blind randomized placebo-controlled trial.

Hoare DJ, Pierzycki RH, Thomas H, McAlpine D, Hall DA.
National Institute for Health Research (NIHR) Nottingham Hearing Biomedical Research Unit, University of Nottingham, Ropewalk House, 113 The Ropewalk, Nottingham NG1 5DU, UK.
Derek.Hoare@nottingham.ac.uk.

BACKGROUND: Current theories of tinnitus assume that the phantom sound is generated either through increased spontaneous activity of neurons in the auditory brain, or through pathological temporal firing patterns of the spontaneous neuronal discharge, or a combination of both factors. With this in mind, Tass and colleagues recently tested a number of temporally patterned acoustic stimulation strategies in a proof of concept study. Potential therapeutic sound regimes were derived according to a paradigm assumed to disrupt hypersynchronous neuronal activity, and promote plasticity mechanisms that stabilize a state of asynchronous spontaneous activity. This would correspond to a permanent reduction of tinnitus. The proof of concept study, conducted in Germany, confirmed the safety of the acoustic stimuli for use in tinnitus, and exploratory results indicated modulation of tinnitus-related pathological synchronous activity with potential therapeutic benefit. The most effective stimulation paradigm is now in clinical use as a sound therapy device, the acoustic coordinated reset (CR®) neuromodulation (Adaptive Neuromodulation GmbH (ANM), Köln, Germany). METHODS/DESIGN: To measure the efficacy of CR® neuromodulation, we devised a powered, two-center, randomized controlled trial (RCT) compliant with the reporting standards defined in the Consolidated Standards of Reporting Trials (CONSORT) Statement. The RCT design also addresses the recent call for international standards within the tinnitus community for high-quality clinical trials. The design uses a between-subjects comparison with minimized allocation of participants to treatment and placebo groups. A minimization approach was selected to ensure that the two groups are balanced with
respect to age, gender, hearing, and baseline tinnitus severity. The protocol ensures double blinding, with crossover of the placebo group to receive the proprietary intervention after 12 weeks. The primary endpoints are the pre- and post-treatment measures that provide the primary measures of efficacy, namely a validated and sensitive questionnaire measure of the functional impact of tinnitus. The trial is also designed to capture secondary changes in tinnitus handicap, quality (pitch, loudness, bandwidth), and changes in tinnitus-related pathological synchronous brain activity using electroencephalography (EEG). DISCUSSION: This RCT was designed to provide a confident high-level estimate of the efficacy of sound therapy using CR® neuromodulation compared to a well-matched placebo intervention, and uniquely in terms of sound therapy, examine the physiological effects of the intervention against its putative mechanism of action. TRIAL REGISTRATION: ClinicalTrials.gov, NCT01541969. Free PMC Article.

[A method of synthesizing cicada sound for treatment of tinnitus].
[Article in Chinese]

Wang Y, He P, Pan F, Cui T, Wang H.
School of Electronic and Information Engineering, Sichuan University, Chengdu 610065, China. 543609392@qq.com.

Masking therapy can make patients accustom to tinnitus. This therapy is safe and easy to implement, so that it has become a widely used treatment of curing tinnitus. According to surveys of tinnitus sounds, cicada sound is one of the most usual tinnitus. Meanwhile, we have not hitherto found published papers concerning how to synthesize cicada sound and to use it to ameliorate tinnitus. Inspired by the human acoustics theory, we proposed a method to synthesize medical masking sound and to realize the diversity by illustrating the process of synthesizing various cicada sounds. In addition, energy attenuation problem in spectrum shifting process has been successfully solved. Simulation results indicated that the proposed method achieved decent results and would have practical value for the future applications.

Prescription of hearing-aid output for tinnitus relief.
Int J Audiol. 2013 Jul 17. [Epub ahead of print]

Shekhawat GS, Searchfield GD, Kobayashi K, Stinear CM.
* Section of Audiology, University of Auckland, New Zealand.

Objective: Tinnitus is a perceived sound that cannot be attributed to an external source. This study attempts to identify a prescription of amplification that is optimized as a first-fit setting for tinnitus relief.
Design: Participants compared the effect of high frequency amplification on their tinnitus. Stimuli were 13 speech files with different amounts of high frequency amplification (three cut-off frequencies and four gain settings) to simulate the effects of a change in DSL(I/O) v5.0 prescription in the high frequencies. Study sample: Twenty-five participants with chronic tinnitus participated in the study. Results: A 6-dB reduction to prescribed gain at 2 kHz emerged as the most preferred output (26.47% participants) to interfere with participants’ tinnitus. Overall, 70.58% of the participants’ preferred a 3 to 6 dB reduction in output while 29.42% preferred a similar increase across all cut-off frequencies. A trend was observed in which the higher the tinnitus pitch the more similar the preferred output to DSL(I/O) v5.0. Conclusion: DSL(I/O) v5.0 appears to be a good starting point for prescription of hearing-aid output for tinnitus management. Long-term benefits of different prescriptions for tinnitus still need to be ascertained.
Clinical Outcome After Cochlear Implantation in Patients With Unilateral Hearing Loss Due to Labyrinthitis Ossificans.
Otol Neurotol. 2013 Aug 5. [Epub ahead of print]

Department of Otorhinolaryngology-Head and Neck Surgery, University Medical Center Freiburg, Germany.

OBJECTIVES: Cochlear implantation (CI) is the treatment of choice in bilateral labyrinthitis ossificans (LO). The aim of this clinical case study was to evaluate audiologic and subjective outcomes after CI treatment for unilateral hearing loss (UHL) because of LO and to identify optimal timing for treatment. PATIENTS: Three subjects (age 40, 54, and 68 yr) with UHL because of LO were enrolled. Duration of deafness was 1.5, 12, and 120 months. INTERVENTION: After extensive consultation, testing with conventional contralateral routing of signal hearing aid and bone-anchored hearing instrument, CI candidacy was confirmed and CI surgery performed. MAIN OUTCOME MEASURES: Test of open-set speech recognition in background noise and sound localization were performed preoperatively, in unaided and aided conditions, and in the CI-aided condition, at 6 and 12 months postoperatively. Subjective assessment via the Speech, Spatial and Qualities scale (SSQ) and the Tinnitus Visual Analogue Scale was performed at preimplant and 12 months postimplant. CONCLUSION: The data show moderate-to-high hearing benefit after CI in 2 cases and no benefit for the third. SSQ and tinnitus scales show benefit from CI use in both cases. CI treatment should be performed as early as possible, ideally before signs of obliteration are evident. Counseling on all rehabilitation options is important.

[Evaluating the effects of hearing aids combined with psychological counseling on tinnitus in patients with deafness].
[Article in Chinese]
Lin Chung Er Bi Yan Hou Tou Jing Wai Ke Za Zhi. 2013 May;27(10):461-4.

Department of Otorhinolaryngology, the General Hospital of Tianjin Medical University, Tianjin, 300052, China.

OBJECTIVE: To evaluate the effects of hearing aids combined with psychological counseling on subjective tinnitus. METHOD: One hundred and fifty four tinnitus patients with deafness were randomly divided into two groups: 84 cases in study group, receiving hearing aids combined with psychological counseling therapy; 70 cases in control group, receiving counseling therapy only. Two groups were assessed at 3, 6 and 12 months after the beginning of the therapy. In study group, 6 cases were bilaterally aided and 78 cases were unilaterally aided. The 78 cases are divided into three subgroups: Group A (moderate hearing loss), Group B (moderate to severe hearing loss), and Group C(severe hearing loss) according to the severity of hearing loss. RESULT: At 3, 6 and 12 months after the beginning of the therapy ,the effective rates in study group are 26.19%, 63.10% and 72.62% respectively and the effective rates in control group are 8.57%, 18.57% and 25.71% respectively. There are statistically significant differences between the effective rates of the two groups after 3,6 and 12 months since the therapy started (P < 0.01). The tinnitus improvement of Group A is the most, and that of Group C is the least. The effective rate of Group A is higher than groups B and C with statistically significant differences (P < 0.0167). The effective rate of Group B is higher than Group C while with no statistically significant difference(P > 0.05). CONCLUSION: Hearing aids can not only improve hearing but also help with the treatment of tinnitus. Hearing aids combined with psychological counseling treatment is an ideal method for dealing with tinnitus in patients with deafness.
A computational model with plasticity for tinnitus generation and its relief by sound therapy (Conference Paper)
Proceedings of the IASTED International Conference on Modelling and Simulation, 2013, Pages 39-44
24th IASTED International Conference on Modelling and Simulation, MS 2013; Banff, AB; Canada; 17 July 2013 through 19 July 2013; Code 99098.

Nagashino, H.a , Kinouchi, Y.b , Danesh, A.A.c , Pandya, A.S.d

a Institute of Health Biosciences, University of Tokushima, 3-18-15 Kuramoto, Tokushima, Japan; b Institute of Technology and Sciences, University of Tokushima, 2-1 Minamijosanjima, Tokushima, Japan; c Department of Communication Sciences and Disorders, Florida Atlantic University, 777 Glades Road, Boca Raton, FL, United States; d Department of Computer and Electrical Engineering and Computer Science, Florida Atlantic University, 777 Glades Road, Boca Raton, FL, United States.

Tinnitus is the perception that one hears sound in the ears or in the head without any external source. Sound therapy is one of the most effective techniques for tinnitus treatment that have been utilized in the clinical settings. In this paper, a computational and dynamical model with plasticity is proposed using Bonheoffer-van der Pol (BVP) equations in order to investigate mechanisms of the generation of tinnitus and the clinical effects of sound therapy. This model can replicate the tinnitus generation with hearing loss and the clinical observations in which human auditory system temporarily halts perception of tinnitus following the treatment by sound therapy.

The Characteristic and Changes of the Event-Related Potentials (ERP) and Brain Topographic Maps before and after Treatment with rTMS in Subjective Tinnitus Patients.

OBJECTIVES: To compare the event-related potentials (ERPs) and brain topographic maps characteristic and change in normal controls and subjective tinnitus patients before and after repetitive transcranial magnetic stimulation (rTMS) treatment. METHODS AND PARTICIPANTS: The ERPs and brain topographic maps elicited by target stimulus were compared before and after 1-week treatment with rTMS in 20 subjective tinnitus patients and 16 healthy controls. RESULTS: Before rTMS, target stimulus elicited a larger N1 component than the standard stimuli (repeating sounds) in control group but not in tinnitus patients. Instead, the tinnitus group pre-treatment exhibited larger amplitude of N1 in response to standard stimuli than to deviant stimuli. Furthermore tinnitus patients had smaller mismatch negativity (MMN) and late discriminative negativity (LDN) component at Fz compared with the control group. After rTMS treatment, tinnitus patients showed increased N1 response to deviant stimuli and larger MMN and LDN compared with pre-treatment. The topographic maps for the tinnitus group before rTMS -treatment demonstrated global asymmetry between the left and right cerebral hemispheres with more negative activities in left side and more positive activities in right side. In contrast, the brain topographic maps for patients after rTMS-treatment and controls seem roughly symmetrical. The ERP amplitudes and brain topographic maps in post-treatment patient group showed no significant difference with those in controls. CONCLUSIONS: The characterical changes in ERP and brain topographic maps in tinnitus patients maybe related with the electrophysiological mechanism of tinnitus induction and development. It can be used as an objective biomarker for the evaluation of auditory central in subjective tinnitus patients. These findings support the notion that rTMS treatment in tinnitus patients may exert a beneficial effect.
Eur Arch Otorhinolaryngol. 2013 Oct 6. [Epub ahead of print]

Vlastarakos PV, Nazos K, Tavoulari EF, Nikolopoulos TP.

ENT Department, MITERA Infirmary, 6 Erythrou Stavrou Str, Marousi-Athens, 15123, Greece, pevlast@hotmail.com.

The aim of the present paper is to critically review the current evidence on the efficacy of cochlear implantation as a treatment modality for single-sided deafness (SSD), and/or unilateral tinnitus. Systematic literature review in Medline and other database sources was conducted along with critical analysis of pooled data. The study selection includes prospective and retrospective comparative studies, case series and case reports. The total number of analyzed studies was 17. A total of 108 patients with SSD have been implanted; 66 patients due to problems associated with SSD, and 42 primarily because of debilitating tinnitus. Cochlear implantation in SSD leads to improved sound localization performance and speech perception in noise from the ipsilateral side with an angle of coverage up to (but not including) 90° to the front, when noise is present in the contralateral quartile (Strength of recommendation B). Speech and spatial hearing also subjectively improve following the insertion of a cochlear implant (Strength of recommendation B); this was not the case regarding the quality of hearing. Tinnitus improvement was also reported following implant placement (Strength of recommendation B); however, patients need to be advised that the suppression is mainly successful when the implant is activated. The overall quality of the available evidence supports a wider use of cochlear implantation in SSD following appropriate selection and counseling (overall strength of recommendation B). It remains to be seen if the long-term follow-up of large number of patients in well conducted high quality studies will confirm the above mentioned results.


Popovych OV, Yanchuk S, Tass PA.

Institute of Neuroscience and Medicine - Neuromodulation (INM-7), Research Center Jülich, 52425 Jülich, Germany.

Intuitively one might expect independent noise to be a powerful tool for desynchronizing a population of synchronized neurons. We here show that, intriguingly, for oscillatory neural populations with adaptive synaptic weights governed by spike timing-dependent plasticity (STDP) the opposite is true. We found that the mean synaptic coupling in such systems increases dynamically in response to the increase of the noise intensity, and there is an optimal noise level, where the amount of synaptic coupling gets maximal in a resonance-like manner as found for the stochastic or coherence resonances, although the mechanism in our case is different. This constitutes a noise-induced self-organization of the synaptic connectivity, which effectively counteracts the desynchronizing impact of independent noise over a wide range of the noise intensity. Given the attempts to counteract neural synchrony underlying tinnitus with noisers and maskers, our results may be of clinical relevance. Free Article.
A neuronal network model with simplified tonotopicity for tinnitus generation and its relief by sound therapy.
Nagashino H, Kinouchi Y, Danesh AA, Pandya AS.

Tinnitus is the perception of sound in the ears or in the head where no external source is present. Sound therapy is one of the most effective techniques for tinnitus treatment that have been proposed. In order to investigate mechanisms of tinnitus generation and the clinical effects of sound therapy, we have proposed conceptual and computational models with plasticity using a neural oscillator or a neuronal network model. In the present paper, we propose a neuronal network model with simplified tonotopicity of the auditory system as more detailed structure. In this model an integrate-and-fire neuron model is employed and homeostatic plasticity is incorporated. The computer simulation results show that the present model can show the generation of oscillation and its cessation by external input. It suggests that the present framework is promising as a modeling for the tinnitus generation and the effects of sound therapy.

A new concept for noninvasive tinnitus treatment utilizing multimodal pathways.
Gloeckner CD, Smith BT, Markovitz CD, Lim HH.

Current noninvasive treatments for tinnitus have shown mixed results. There have been encouraging developments in using invasive brain or vagal nerve stimulation to modulate neural populations driving the tinnitus percept. However, these invasive treatments can only be used in a small patient population with severe conditions. In this preliminary study, we present a new treatment option we call Multimodal Synchronization Therapy (MST), which attempts to achieve synchronized and localized brain activation without invasive neural stimulation. MST combines multiple sensory, motor, limbic, and cognitive inputs to elicit activation of multimodal neurons to potentially modulate specific neurons driving the tinnitus percept. We present preliminary data in a guinea pig model showing activation of somatosensory and auditory pathways to alter neural activity within the inferior colliculus, a multimodal integration region that has shown pathological changes in animals and patients with tinnitus. Electrical stimulation of different body locations induced excitatory responses in the inferior colliculus, eliciting responses in up to 41% of all recording sites for a given somatic site. Paired somatic and acoustic stimulation resulted in enhanced or suppressed acoustic-driven neural activity in the inferior colliculus that varied depending on stimulation and recording location. Similar modulation effects were observed in the auditory cortex, which may relate to changes in auditory perception. Further studies need to incorporate multiple multimodal pathways and must also confirm that MST can suppress the abnormal neural patterns that directly drive the tinnitus percept.
Comparing single-site with multisite rTMS for the treatment of chronic tinnitus - clinical effects and neuroscientific insights: study protocol for a randomized controlled trial.
Lehner A, Schecklmann M, Kreuzer PM, Poeppl TB, Rupprecht R, Langguth B.
Department of Psychiatry and Psychotherapy, University of Regensburg, Universitaetsstraße 84, Regensburg 93053, Germany

Several years ago, repetitive transcranial magnetic stimulation (rTMS) of the auditory cortex has been introduced as a treatment approach for chronic tinnitus. Even if this treatment is beneficial for a subgroup of patients, the overall effects are limited. This limitation may be due to the fact that the auditory cortex is only one of several brain areas involved in tinnitus. Whereas auditory areas are considered to code for tinnitus loudness, conscious perception of and attention allocation to tinnitus is supposed to be reflected by network activity involving frontal and parietal cortical areas. The aim of the present study is to influence this frontoparietal network more efficiently by perturbing the most important nodes with rTMS.

Methods/design: This is a randomized, double-blind, parallel-group study. Patients receive rTMS treatment on 10 consecutive working days using either the multisite rTMS protocol (left dorsolateral prefrontal, 1,000 stimuli, 20 Hz; left temporoparietal, 1,000 stimuli, 1 Hz; right temporoparietal stimulation, 1,000 stimuli, 1 Hz) or a single-site protocol (unilateral stimulation of the temporoparietal cortex, 3,000 stimuli, 1 Hz). Individuals aged 18 to 70 years with chronic tinnitus >=6-month duration and a Tinnitus Handicap Inventory score >=38 are recruited for the study. A total of 50 patients are needed to detect a clinical relevant change of tinnitus severity (alpha = 0.05; 1 -- beta = 0.80). Primary outcome measures are the change in the Tinnitus Questionnaire score from baseline to the end of treatment as well as the number of treatment responders as defined by a reduction in the Tinnitus Questionnaire score of >=5 points. Furthermore, changes in brain structure and activity are assessed using (functional) magnetic resonance imaging and electroencephalography in the resting state. Those measurements are also performed in 25 healthy control subjects. DISCUSSION: This study is designed to reveal whether network stimulation is superior to single-site stimulation in the treatment of chronic tinnitus. Furthermore, the comparison between tinnitus patients and healthy controls and the longitudinal effects of both rTMS treatment protocols on brain structure and function allow inferences to be made about the neural correlates of tinnitus. Trial registration: Clinical Trials: NCT01663324.

Short term effects of repetitive transcranial magnetic stimulation in patients with catastrophic intractable tinnitus: preliminary report.
Lee HY, Yoo SD, Ryu EW, Byun JY, Yeo SG, Park MS.
Department of Otorhinolaryngology-Head and Neck Surgery, Kyung Hee University School of Medicine, Seoul, Korea. Department of Otorhinolaryngology, Eulji University Hospital, Eulji University, Daejeon, Korea.

OBJECTIVES: The short-term effects of low-frequency repetitive transcranial magnetic stimulation (rTMS) in the patients with catastrophic and intractable tinnitus were investigated. METHODS: Fifteen participants were recruited among patients with catastrophic intractable tinnitus to receive 1 Hz rTMS treatment. Tinnitus severity was assessed before rTMS and directly after sham or real rTMS using the tinnitus handicap inventory (THI) and visual analog scale (VAS). RESULTS: There was no statistical difference in the THI score before and after sham stimulation. However, after 5 replications of real rTMS there was statistically significant reduction in THI score. Eight patients showed a decrease of more than 10 in THI score. Patients who showed a vast change in THI score after rTMS also showed a large decrease in their VAS score (r=0.879, P<0.001). Duration of tinnitus and change of THI score showed statistically significant moderate negative correlation (r=-0.637, P=0.011). But in case of VAS, there was no significant difference between VAS and duration of tinnitus. CONCLUSION: Among total 15 patients with catastrophic intractable chronic tinnitus, eight patients showed some improvement in symptoms after 1 Hz rTMS. rTMS can be considered management modality for intractable tinnitus even with distress as severe as catastrophic stage.
Comparison of the outcomes of repetitive transcranial magnetic stimulation to the ipsilateral and contralateral auditory cortex in unilateral tinnitus.
Kim BG, Kim DY, Kim SK, Kim JM, Baek SH, Moon IS.
Department of Otorhinolaryngology and.

Abstract Transcranial magnetic stimulation (TMS) is a noninvasive method of activating or deactivating focal areas of the human brain. Repetitive TMS (rTMS) applied over the temporoparietal cortex has been reported to show therapeutic effects on tinnitus. We compared the effects of 1 Hz rTMS delivered either contralaterally or ipsilaterally to the symptomatic ear in patients with unilateral tinnitus. Forty patients with asymmetric hearing loss and non-pulsatile tinnitus localized to poorer ear of 6 months in duration or greater who were refractory to medication were enrolled in this study. Patients were assigned randomly to one of two treatment groups: with 1 Hz stimulation applied the temporoparietal junction either ipsilaterally (n = 21) or contralaterally (n = 19) to the symptomatic ear. The patients were given 600 pulses per session daily for 5 d. Changes in the tinnitus handicap inventory (THI) and self-rating visual analog scores (VAS) for loudness, awareness and annoyance were analyzed before, immediately after and 1 month after treatment. There was no significant difference in the rate of patients with marked improvement between ipsilateral and contralateral stimulation groups. In addition, there were no significant differences in the amount of decreases in THI scores and VAS between the two groups immediately or 1 month after rTMS. Finally, significant decreases in THI scores and most VAS were observed 1 month after rTMS in both groups compared to pretreatment. Daily treatment with 1 Hz rTMS ipsilaterally and contralaterally to the side of tinnitus both had significant beneficial effects. The laterality of stimulation with 1 Hz rTMS is not the decisive factor in relieving symptoms.

Comparison of two protocols of transcranial magnetic stimulation for treatment of chronic tinnitus:
a randomized controlled clinical trial of burst repetitive versus high-frequency repetitive transcranial magnetic stimulation.
Neurol Sci. 2013 Jul 13. [Epub ahead of print]
Forogh B, Yazdi-Bahri SM, Ahadi T, Fereshtehnejad SM, Raissi GR.
Department of Physical Medicine and Rehabilitation, Iran University of Medical Sciences, Tehran, Iran.
The aim of the study was to compare the effects of two techniques of repetitive Transcranial Magnetic Stimulation (rTMS) to treat chronic tinnitus; continuous Theta Burst Stimulation (cTBS) and high-frequency rTMS. In a controlled randomized clinical trial, 55 patients with chronic tinnitus were randomly divided in two groups. They received four sessions of treatment. cTBS was tested on one group and high-frequency rTMS (10 Hz) was tested on the other. Severity of the tinnitus was assessed before treatment, after the last treatment session and then 1-month later. Both the treatments of high-frequency and cTBS had a suppressive effect on tinnitus. However, cTBS was more effective than high-frequency rTMS (P = 0.001). This study suggests that rTMS even in four sessions is effective in reducing tinnitus severity; moreover, compared to high-frequency TMS better results can be achieved with cTBS.
Tinnitus: therapeutic use of superficial brain stimulation.
Langguth B, De Ridder D.
Interdisciplinary Tinnitus Clinic, Department of Psychiatry and Psychotherapy, University of Regensburg, Regensburg, Germany. Electronic address: Berthold.Langguth@medbo.de.

Tinnitus is a common disorder and traditional treatment approaches such as medication, active or passive sound enhancement, and cognitive behavioral therapy have limited efficacy. Thus, there is an urgent need for more effective treatment approaches. Functional imaging studies in patients with tinnitus have revealed alterations in neuronal activity of central auditory pathways, probably resulting as a consequence of sensory deafferentation. However, nonauditory brain areas are also involved. These nonauditory brain areas might represent both an "awareness" network involved in the conscious perception of the tinnitus signal as well as areas related to a nontinnitus-specific distress network consisting of the anterior cingulate cortex, anterior insula, and amygdala. Moreover, memory mechanisms involving the hippocampus and the parahippocampal region may play a role in the persistence of the awareness of the phantom percept, as well as in the reinforcement of the associated distress. All of these networks represent potential targets for treatment via pharmacological treatment or noninvasive and invasive brain stimulation. Repetitive transcranial magnetic stimulation (rTMS) is a noninvasive method of applying electromagnetic fields to the brain that can induce alterations of neuronal activity that outlast the stimulation period. Single sessions of rTMS over the temporal or temporoparietal cortex have been successful in transiently reducing tinnitus perception. Repeated sessions of rTMS have resulted in tinnitus relief in a subgroup of patients, lasting from several days to several months. However, effect sizes of rTMS in the treatment of tinnitus are only moderate, and interindividual variability is high. Larger and longer lasting effects have been observed with direct electrical stimulation of the auditory cortex via implanted epidural electrodes. Transcranial direct current stimulation (tDCS) has also shown potential for the treatment of tinnitus. Both auditory and frontal tDCS have shown tinnitus reduction in a subgroup of patients. In spite of the promising results of the different brain stimulation approaches, further research is needed before these techniques can be recommended for routine clinical use. © 2013 Elsevier B.V. All rights reserved.

A new concept for noninvasive tinnitus treatment utilizing multimodal pathways.
Gloeckner CD, Smith BT, Markovitz CD, Lim HH.

Current noninvasive treatments for tinnitus have shown mixed results. There have been encouraging developments in using invasive brain or vagal nerve stimulation to modulate neural populations driving the tinnitus percept. However, these invasive treatments can only be used in a small patient population with severe conditions. In this preliminary study, we present a new treatment option we call Multimodal Synchronization Therapy (MST), which attempts to achieve synchronized and localized brain activation without invasive neural stimulation. MST combines multiple sensory, motor, limbic, and cognitive inputs to elicit activation of multimodal neurons to potentially modulate specific neurons driving the tinnitus percept. We present preliminary data in a guinea pig model showing activation of somatosensory and auditory pathways to alter neural activity within the inferior colliculus, a multimodal integration region that has shown pathological changes in animals and patients with tinnitus. Electrical stimulation of different body locations induced excitatory responses in the inferior colliculus, eliciting responses in up to 41% of all recording sites for a given somatic site. Paired somatic and acoustic stimulation resulted in enhanced or suppressed acoustic-driven neural activity in the inferior colliculus that varied depending on stimulation and recording location. Similar modulation effects were observed in the auditory cortex, which may relate to changes in auditory perception. Further studies need to incorporate multiple multimodal pathways and must also confirm that MST can suppress the abnormal neural patterns that directly drive the tinnitus percept.
VIII Behavioral Therapy


Nyenhuis N, Golm D, Kröner-Herwig B.

a Department of Clinical Psychology and Psychotherapy, University of Göttingen, Göttingen, Germany.

This study is a review and meta-analysis on the efficacy of cognitive-behavioural therapy (CBT) self-help interventions for tinnitus. Randomized controlled trials were identified by searching in databases (e.g. ISI Web of Knowledge, PubMed, Cochrane Library, and PSYNDEX) and by manual search. Ten studies with 1188 participants in total were included in the meta-analysis. Participants were 49.2 years old and had tinnitus for 5.2 years. Self-help interventions significantly reduced tinnitus distress (d = 0.48) and depressiveness (d = 0.25) when compared with a passive control (e.g. information only and discussion forums) at post-assessment. There was no difference to the face-to-face controls (group treatment). The presence of therapists and the methodological quality of the studies did not influence the results. Sensitivity analysis revealed that there might be a publication bias regarding the comparison to the face-to-face control. However, the results suggest that CBT self-help interventions are an effective treatment for tinnitus distress. Since few studies were identified, this conclusion must be supported by future meta-analyses.


Andersson G, Hesser H, Cima RF, Weise C.

a Department of Behavioural Sciences and Learning, Linnaeus Centre HEAD, Swedish Institute for Disability Research, Linköping University, Sweden.

Several studies show that patients with depression and post-traumatic stress disorder respond with fewer specific autobiographical memories in a cued memory task (i.e. the autobiographical memory test; AMT) compared to healthy controls. One previous study found this phenomenon among tinnitus patients as well (Andersson, Ingerholt, & Jansson, 2003). The aim of this study was to replicate the previous study with an additional control group of depressed patients and memory errors as measured with the AMT as an additional outcome. We included 20 normal hearing tinnitus patients, 20 healthy controls and 20 persons diagnosed with clinical depression. The AMT was administered together with self-report measures of depression, anxiety and tinnitus distress. Both the tinnitus and depression groups differed from the healthy control group in that they reported fewer specific autobiographical memories. There were, however, differences between the tinnitus and depression groups in terms of the errors made on the AMT. The depression group had more overgeneral memories than the normal control group, whereas the tinnitus group did not differ from the control group on this memory error. The tinnitus group had more semantic associations and non-memories than the other two groups, suggesting that executive functioning may play a role for the tinnitus group when completing the AMT. Clinical and theoretical implications of the findings are discussed.
Acceptance as a mediator in internet-delivered acceptance and commitment therapy and cognitive behavior therapy for tinnitus.

Hesser H, Westin VZ, Andersson G.
Department of Behavioural Sciences and Learning, Linnaeus Centre HEAD, Swedish Institute for Disability Research, Linköping University, 581 83, Linköping, Sweden, hugo.hesser@liu.se.

Despite demonstrated efficacy of behavioral and cognitive techniques in treating the impact of tinnitus (constant ringing in the ears), little is known about the mechanisms by which these techniques achieve their effect. The present study examined acceptance of tinnitus as a potential mediator of treatment changes on global tinnitus severity in internet-delivered acceptance and commitment therapy (iACT) and internet-delivered cognitive behavior therapy (iCBT). Data from 67 participants who were distressed by tinnitus and who were randomly assigned to 1 of the 2 treatments were analyzed using a multilevel moderated mediation model. We predicted that acceptance as measured with the two subscales of the tinnitus acceptance questionnaire (i.e., activity engagement and tinnitus suppression) would mediate the outcome in iACT, but not in iCBT. Results provided partial support to the notion that mediation was moderated by treatment: tinnitus suppression mediated changes in tinnitus severity in iACT, but not in iCBT. However, inconsistent with the view that the treatments worked through different processes of change, activity engagement mediated treatment changes across both iACT and iCBT. Acceptance is identified as a key source of therapeutic change in behavioral-based treatments for tinnitus.

Music therapy as an early intervention to prevent chronification of tinnitus.

Grapp M, Hutter E, Argstatter H, Plinkert PK, Bolay HV.
German Center for Music Therapy Research Maaßstraße 32/1, 69123 Heidelberg, Germany.

In the present study a music therapeutic intervention according to the 'Heidelberg Model' was evaluated as a complementary treatment option for patients with acute tinnitus whom medical treatment only brought minimal or no improvement. The central question was if music therapy in an early phase of tinnitus was able to reduce tinnitus symptoms and to prevent them from becoming chronic. 23 patients with acute tinnitus (6-12 weeks) were included in this study and took part in our manualized short term music therapeutic treatment which lasted ten consecutive 50-minutes sessions of individualized therapy. Tinnitus severity and individual tinnitus related distress were assessed by the Tinnitus Beeinträchtigungs-Fragebogen (i.e. Tinnitus Impairment Questionnaire, TBF-12) at baseline, start of treatment, and end of treatment. Score changes in TBF-12 from start to end of the treatment showed significant improvements in tinnitus impairment. This indicates that this music therapy approach applied in an initial stage of tinnitus can make an important contribution towards preventing tinnitus from becoming a chronic condition.
Illness representations as mediators of the relationship between dispositional optimism and depression in patients with chronic tinnitus: A cross-sectional study.  

Vollmann M, Scharloo M, Langguth B, Kalkouskaya N, Salewski C.

Objective: Both dispositional optimism and illness representations are related to psychological health in chronic patients. In a group of chronic tinnitus sufferers, the interplay between these two variables was examined. Specifically, it was tested to what extent the relationship between dispositional optimism and depression is mediated by more positive illness representations.  

Method: The study had a cross-sectional design. One hundred and eighteen patients diagnosed with chronic tinnitus completed questionnaires assessing optimism (Life Orientation Test-Revised [LOT-R]), illness representations (Illness Perceptions Questionnaire-Revised [IPQ-R]) and depression (Hospital Anxiety and Depression Scale [HADS]).

Results: Correlation analysis showed that optimism was associated with more positive illness representations and lower levels of depression. Simple mediation analyses revealed that the relationship between optimism and depression was partially mediated by the illness representation dimensions consequences, treatment control, coherence, emotional representations and internal causes. A multiple mediation analysis indicated that the total mediation effect of illness representations is particularly due to the dimension consequences. Conclusion: Optimism influences depression in tinnitus patients both directly and indirectly. The indirect effect indicates that optimism is associated with more positive tinnitus-specific illness representations which, in turn, are related to less depression. These findings contribute to a better understanding of the interplay between generalised expectancies, illness-specific perceptions and psychological adjustment to medical conditions.

Neuro-music therapy for recent-onset Tinnitus: A Pilot study. 

Grapp, M.\(^a\), Hutter, E.\(^a\), Argstatter, H.\(^a\), Plinkert, P.K.\(^b\), Bolay, H.V.\(^a\)

\(^a\) German Center for Music Therapy Research, Deutsches Zentrum für Musiktherapieforschung [Viktor Dulger Institut] DZM e.V. Maaßstraße 32/1, 69123 Heidelberg, Germany. \(^b\) University Hospital for Ear, Nose, and Throat, University of Heidelberg, Germany.

The aim of this pilot study was the evaluation of the neuro-music therapy approach as a new treatment option for patients with recent-onset tinnitus whose tinnitus symptoms were enduring after initial pharmacological treatment. In all, 15 patients with recent-onset tinnitus took part in our manualized short-term music-therapeutic treatment. Tinnitus severity and individual tinnitus distress were assessed by the German version of the tinnitus questionnaire (TQ) and the Attention and Performance Self-Assessment Scale (APSA) at three different measurement times: baseline (T0), start of treatment (T1), and end of treatment (T2). Score changes in TQ and APSA from start to end of treatment indicated significant improvements in tinnitus-related distress. According to the Jacobson and Truax reliable change index (RC), 73.3% of the patients showed a reliable reduction in individual TQ-score. The neuro-music therapy for recent-onset tinnitus according to the "Heidelberg Model" introduced in this pilot study seems to provide an effective treatment option for patients with recent-onset tinnitus. © The Author(s) 2013. Free full text.
IX Somatic Tinnitus

Prevalence and factors associated with neck and jaw muscle modulation of tinnitus.

Won JY, Yoo S, Lee SK, Choi HK, Yakunina N, Le Q, Nam EC.
Department of Otolaryngology, Kangwon National University School of Medicine, Chuncheon, Vietnam.

Forceful contractions of neck and jaw muscles have consistently been shown to modulate tinnitus and can be used to screen patients who are responsive to somatic stimulation and, therefore, optimal candidates for somatosensory-based treatment. To identify the factors associated with somatic modulation of tinnitus, 163 patients underwent 19 neck and jaw maneuvers after an extensive physiological and audiological profile was compiled. Overall, tinnitus was modulated in 57.1% of ears tested. Unilateral tinnitus showed greater prevalence of modulation. Neck maneuvers generally decreased tinnitus loudness, whereas jaw maneuvers increased loudness. Female gender and buzzing tinnitus were associated with a high prevalence of modulation and a decrease in tinnitus loudness. Loud tinnitus and low-pitched tonal tinnitus were associated with exacerbation of the condition as a result of somatic testing. Use of these characteristics to select optimal candidates for somatosensory-based tinnitus therapies may be essential for the development of an effective approach for tinnitus treatment. Copyright © 2013 S. Karger AG, Basel.

Improving tinnitus with mechanical treatment of the cervical spine and jaw.

Cherian K, Cherian N, Cook C, Kaltenbach JA.
Department of Rehabilitation and Sports Therapy, Neurological Institute, Cleveland Clinic, Cleveland, OH.

Background: Tinnitus affects approximately 30-50 million Americans. In approximately 0.5-1.0% of the population, tinnitus has a moderate to severe impact on their quality of life. Musculature and joint pathologies of the head and neck are frequently associated with tinnitus and have been hypothesized to play a contributing role in its etiology. However, specific physical therapy interventions to assist in improving tinnitus have not yet been reported. Purpose: To describe the examination and treatment intervention of a patient with subjective tinnitus. Patient Description: The patient was a 42-yr-old male experiencing intermittent bilateral tinnitus, headaches, blurred vision, and neck tightness. His occupation required long-term positioning into neck protraction. Examination found limitations in cervical extension, bilateral rotation, and side bending. Asymmetry was also noted with temporomandibular joint (TMJ) movements. Upon initial evaluation the patient demonstrated functional, physical, and emotional deficits per neck, headache, and dizziness self-report scales and a score on the Tinnitus Handicap Inventory (THI) of 62. Resisted muscle contractions of the cervical spine in flexion, extension, and rotation increased his tinnitus. Intervention: Treatment focused on normalizing cervical spine mobility through repetitive movements, joint mobilization, and soft tissue massage. Results: At 2.5 mo, the patient demonstrated a complete reversal of his tinnitus after 10 physical therapy sessions as noted by his score of 0 on the THI upon discharge. He also demonstrated objective improvements in his cervical motion. This case reflected treatment targeted at cervical and TMJ impairments and notable improvements to tinnitus. Future studies should further explore the direct and indirect treatment of tinnitus by physical therapists through clinical trials. American Academy of Audiology.
A new concept for noninvasive tinnitus treatment utilizing multimodal pathways.

Gloeckner CD, Smith BT, Markovitz CD, Lim HH.

Current noninvasive treatments for tinnitus have shown mixed results. There have been encouraging developments in using invasive brain or vagal nerve stimulation to modulate neural populations driving the tinnitus percept. However, these invasive treatments can only be used in a small patient population with severe conditions. In this preliminary study, we present a new treatment option we call Multimodal Synchronization Therapy (MST), which attempts to achieve synchronized and localized brain activation without invasive neural stimulation. MST combines multiple sensory, motor, limbic, and cognitive inputs to elicit activation of multimodal neurons to potentially modulate specific neurons driving the tinnitus percept. We present preliminary data in a guinea pig model showing activation of somatosensory and auditory pathways to alter neural activity within the inferior colliculus, a multimodal integration region that has shown pathological changes in animals and patients with tinnitus. Electrical stimulation of different body locations induced excitatory responses in the inferior colliculus, eliciting responses in up to 41% of all recording sites for a given somatic site. Paired somatic and acoustic stimulation resulted in enhanced or suppressed acoustic-driven neural activity in the inferior colliculus that varied depending on stimulation and recording location. Similar modulation effects were observed in the auditory cortex, which may relate to changes in auditory perception. Further studies need to incorporate multiple multimodal pathways and must also confirm that MST can suppress the abnormal neural patterns that directly drive the tinnitus percept.

Surgical Treatment

Acoustic neuroma observation associated with an increase in symptomatic tinnitus: results of the 2007-2008 Acoustic Neuroma Association survey.

Van Gompel JJ, Patel J, Danner C, Zhang AN, Samy Youssef AA, van Loveren HR, Agazzi S.
Departments of Neurosurgery and Brain Repair.

Object Tinnitus is a known presenting symptom of acoustic neuromas, but little is known about the impact of observation or treatment on tinnitus. Most patients experience improvement with treatment, while others may worsen. Therefore, this study was designed to assess the overall impact of observation and treatment on tinnitus outcome in patients with acoustic tumors. Methods Data from the 2007-2008 Acoustic Neuroma Association survey were used. Tinnitus severity was graded both at presentation and at last follow-up for all patients questioned. This data set was analyzed using the Student t-test and a linear regression model adjusted for possible confounders. Results Overall there were more patients receiving intervention (n = 1138) for their acoustic neuromas than observation (n = 289). Presenting tumor size positively correlated with tinnitus severity score. Regardless of treatment (microsurgery or stereotactic radiosurgery), tinnitus improved at last follow-up and worsened in those who were observed (p = 0.02). When comparing microsurgical options, retrosigmoid and translabyrinthine resection improved tinnitus symptoms (both p < 0.01). Stereotactic radiosurgery had a treatment effect similar to microsurgery. Conclusions Presenting tinnitus severity correlates strongly with tumor size. Furthermore, regardless of treatment, there appears to be an overall reduction in tinnitus severity for all forms of microsurgery and stereotactic radiosurgery. Importantly, observation leads to a worsening in symptomatic tinnitus and therefore should be weighed in the treatment recommendation.
Surgical complications following cochlear implantation in adults based on a proposed reporting consensus.

Jeppesen J, Faber CE.

Department of Otorhinolaryngology, Odense University Hospital, Denmark.

Conclusion: The rate of severe complications was low and cochlear implantation is a relatively safe procedure. Standardization is crucial when reporting on cochlear implant complications to ensure comparability between studies. A consensus on the reporting of complications proposed by a Danish team of researchers was applied, evaluated and found beneficial. Objectives: To report the surgical complications following cochlear implantation at our centre, applying and evaluating a proposed reporting consensus. Methods: A retrospective file review of 308 consecutive adult implantations in 269 patients between 1994 and 2010 at Odense University Hospital was performed. Results: The three most common major complications were wound infection (1.6%), permanent chorda tympani syndrome (1.6%) and electrode migration/misplacement/accidental removal (1.3%). Permanent facial nerve paresis occurred following one implantation (0.3%). Transient chorda tympani syndrome (30.8%), vertigo/dizziness (29.5%) and tinnitus (4.9%) were the most frequent minor complications.

Endolymphatic Sac Surgery Versus Intratympanic Gentamicin for the Treatment of Intractable Ménière’s Disease: A Retrospective Review With Survey.
Otol Neurotol. 2013 Jul 10. [Epub ahead of print]

Paradis J, Hu A, Parnes LS.

Department of Otolaryngology, Head & Neck Surgery, Western, London, Canada.

OBJECTIVES: 1) To review a 10-year experience of endolymphatic sac surgery (ESS) and intratympanic gentamicin (ITG) for intractable Ménière’s disease (MD), and 2) to compare preoperative and postoperative outcomes. DESIGN: Retrospective chart review and survey. SETTING: Tertiary care center. PATIENTS: Patients treated with ESS or ITG between 1997 and 2007 at London Health Sciences Centre were eligible for recruitment. INTERVENTIONS: ESS or ITG. MAIN OUTCOMES: 1) 1995 American Academy of Otolaryngology-Head and Neck Surgery hearing stage, vertigo class, and functional level; and 2) a 40-item validated quality-of-life questionnaire (MD Outcome Questionnaire). STATISTICAL ANALYSES: Chi-squared and t tests. RESULTS: Sixty-seven patients were recruited (n = 30 ESS; n = 37 ITG). Preoperatively, the ITG group had poorer hearing stage (p = 0.03). There were no differences between groups on preoperative functional level and QOL measures. Postoperatively, ESS patients reported more tinnitus (p = 0.003) and aural fullness (p = 0.01). There were no differences in posttreatment vertigo class. Secondary treatment was required for 27% of patients in the ESS compared with 3% in the ITG. Posttreatment hearing remained unchanged for the ITG and was overall decreased in the ESS group (p = 0.03). Participants in the ITG reported better postoperative functional levels (p = 0.02) and higher global (p = 0.04), social (p = 0.001), and overall QOL scores (p = 0.03). CONCLUSION: ITG, compared with ESS, reveals better posttreatment functional levels, and superior global, social, and overall QOL scores. Although no statistical difference in vertigo class, a clinical difference is observed.
OBJECTIVE: To discuss the diagnosis and management of venous original pulsatile tinnitus associated with sigmoid sinus. METHODS: A retrospective study was conducted on 12 patients who were diagnosed with venous original pulsatile tinnitus associated with sigmoid sinus, and treated with sigmoid sinus constriction surgery. The diagnostic evidences for venous original pulsatile tinnitus associated with sigmoid sinus were re-evaluated, the pulsatile tinnitus improvements and MRV study results before and after surgeries associated with sigmoid sinus were compared. RESULTS: Eleven patients got relief of tinnitus within three months after the surgeries, while one patient had no relief. There were ten patients underwent MRV study, the cross-sectional area of the sigmoid sinus in the healthy side was about two times in the tinnitus side. Constriction sigmoid sinus was performed on the twelve patients. The cross-sectional area of the sigmoid sinus of relieved tinnitus patients were compressed by forty-six percent to eighty-three percent. None of the cases complained of any serious complications. CONCLUSIONS: Sigmoid sinus constriction is an available therapy for pulsatile tinnitus at present. More cases and longer follow-up are necessary to evaluate its treatment effect accurately.

Analysis of 101 patients with severe to profound sudden unilateral hearing loss treated with explorative tympanotomy and sealing of the round window membrane.
Kampfner D, Anagiotos A, Luers JC, Hüttenbrink KB, Preuss SF.
Department of Otorhinolaryngology, Head and Neck Surgery, University Hospital of Cologne, Cologne, Germany, d.kampfner@rfk.landeskrankenhaus.de.

The aim of this retrospective study was to evaluate the effect of sealing of the round window membrane in patients with severe to profound unilateral sudden sensorineural hearing loss (SSNHL). 101 Patients with unilateral SSNHL were treated with tympanotomy and sealing of the round window membrane if hearing did not improve after conservative treatment. Preoperative and postoperative pure tone audiograms after removal of the ear packing were evaluated. A 4-PTA (pure tone audiometry) was used as reference value. The improvement of 4-PTA was analysed; in addition, recovery was evaluated using Siegel's criteria. Mean initial hearing threshold was 101.1 dB. Eighty-one patients had a hearing threshold of 80 dB or more. The average improvement at the time of ear packing was 21.7 dB and a further average recovery of 13.4 dB was recorded in the follow-up. Patients who underwent rapid tympanotomy within 5 days showed a significantly better hearing improvement than patients with delayed tympanotomy (26.9 vs. 14.0 dB, p < 0.02). Age was significantly correlated with the degree of hearing improvement. There was no significant difference of recovery between patients with detected lesions of the round window membrane and those without. Concomitant vertigo and tinnitus showed no significant effect on recovery. Tympanotomy and sealing of the round window membrane is effective in the treatment of severe to profound SSNHL. There is evidence that early surgery performed within 5 days is more effective than later surgery. The existence of a detectable lesion of the round window membrane has no significant influence on recovery.
Angioplasty and Stenting for Intractable Pulsatile Tinnitus Caused by Dural Venous Sinus Stenosis: A Case Series Report.
Otol Neurotol. 2013 Sep 27. [Epub ahead of print]
Baomin L, Yongbing S, Xiangyu C.* Department of Neurosurgery, Chinese PLA General Hospital, Beijing, People's Republic of China; and † Tinnitus Clinic, Department of Otolaryngology-Head and Neck Surgery, Oregon Health and Science University, Portland, Oregon, U.S.A.
OBJECTIVE: Pulsatile tinnitus caused by dural venous sinus (DVS) stenosis is a newly identified form of tinnitus. Its persistent nature can severely affect patients' sleep and quality of life, leading to depression in severe cases. The aim of this report is to investigate the efficacy and safety of angioplasty and stenting in treating this form of tinnitus. STUDY DESIGN: Retrospective review. SETTING: Chinese PLA General Hospital. METHODS: Clinical data of 46 cases of pulsatile tinnitus caused by DVS stenosis treated between December 2009 and October 2012 using angioplasty and stenting were reviewed. Diagnosis of DVS abnormality was confirmed in all cases using digital subtraction angiography (DSA). Among these cases, stenosis was located in the transverse-sigmoid sinuses junction area ipsilateral to tinnitus in 44 cases and on both sides in the remaining 2 cases. Stenosis was treated with angioplasty and stenting in all cases. RESULTS: Pulsatile tinnitus disappeared immediately after the procedure in all 46 cases. There was no procedure-related complication. During the 2 to 36 months' follow-up, there was no recurrence. CONCLUSION: These results indicate that DVS stenosis is the cause of pulsatile tinnitus in these cases and that angioplasty and stenting are an effective and safe treatment for intractable pulsatile tinnitus caused by DVS stenosis.

Repair of lumbar dural tears with a suture patch: retrospective single-surgeon case series.
Am J Orthop (Belle Mead NJ). 2013 Sep;42(9):E72-5.
Anderson DG, Popov V.
Professor, Department of Orthopaedic Surgery and Neurological Surgery, Rothman Institute, Thomas Jefferson University, Philadelphia, Pennsylvania. greg.anderson@rothmaninstitute.com.
Dural tears traditionally have been treated with repair and then flat bed rest of variable duration. We conducted a study to evaluate the outcome of treating dural tears with a suture patch and immediate mobilization. Fifty patients (28 male, 22 female) had a lumbar dural tear repaired with suture patch and immediate mobilization. Mean age was 58.9 years (range, 31-81 years). Medical records were reviewed to determine the rate of signs and symptoms: headache, photophobia, tinnitus, neck pain, incisional fluctuance, wound drainage, and return to operating room. No patients reported postoperative headache, photophobia, tinnitus, or neck pain. No patients developed wound fluctuance or drainage. One patient was treated medically for a superficial wound infection. No patients required return to the operating room. Dural repair with suture patch appears to be effective and allows early mobilization.

Radiosurgery for Vestibular Schwannomas.
Régis J, Carron R, Delsanti C, Porcheron D, Thomassin JM, Murracciolo X, Roche PH.
Department of Stereotaxic and Functional Neurosurgery, Gammaknife Unit, La Timone University Hospital, Inserm U751, 264, Rue Saint-Pierre 13385 Marseille Cedex 5, France. Electronic address: jregis@mail.ap-hm.fr.
This article investigates the role of radiosurgery and stereotactic radiotherapy in the management of vestibular schwannomas (VS), reviewing the authors' own prospective cohort and the current literature. For patients with large Stage IV VS (according to the Koos classification), a combined approach with deliberate partial microsurgical removal followed by radiosurgery to the residual tumor is proposed. The authors' cohort is unique with respect to the size of the population and the length of the follow-up, and demonstrates the efficacy and safety of VS radiosurgery, with particular regard to its high rate of hearing preservation. Copyright © 2013 Elsevier Inc. All rights reserved.
Effects of deqi on autonomic balance in adult tinnitus patients: study design of a randomized controlled trial.

Li QQ, Shi GX, Fu XX, Han LY, Liu CZ, Wang LP, Hou N.
Acupuncture and Moxibustion Center, Beijing Hospital of Traditional Chinese Medicine affiliated to Capital Medical University, 23 Meishuguanhou Street, Dongcheng District, Beijing 100010, China.

Background. Recent reports suggest that a proportion of tinnitus patients suffer from mental illness. Autonomic nervous system plays a useful role in tinnitus therapy since electrical vagal nerve stimulation (VNS) has been frequently used to alleviate tinnitus-induced depression in clinic. Heart rate variability (HRV), which is reflective of autonomic nervous system function, has been proved to be modulated by acupuncture. In the present study, we aim to compare the effect of deqi sensation on heart rate variability in adult tinnitus patients. Methods. Thirty participants are randomly assigned to verum acupuncture (creating deqi) or shallow acupuncture (not creating deqi) at Baihui (Du-20), Shenting (Du-24), Tinghui (GB-2), Waiguan (SJ-5), and Zulinqi (GB-41) for 3 weeks. The primary outcome measure is heart rate variability, which is measured at the first acupuncture, as well as the last acupuncture. Discussion. Completion of this trial will help to identify the role of deqi sensation in acupuncture effect for tinnitus and reveal an autonomic modulation mechanism for acupuncture effect. Trial Registration. This trial is registered with International Standard Randomised Controlled Trial Number ISRCTN58013563. Free PMC Article.

The effect of low-level laser therapy on hearing.

Goodman SS, Bentler RA, Dittberner A, Mertes IB.
Department of Communication Sciences & Disorders, The University of Iowa, Iowa City, IA 52242, USA.

One purported use of low-level laser therapy (LLLT) is to promote healing in damaged cells. The effects of LLLT on hearing loss and tinnitus have received some study, but results have been equivocal. The purpose of this study was to determine if LLLT improved hearing, speech understanding, and/or cochlear function in adults with hearing loss. Using a randomized, double-blind, placebo-controlled design, subjects were assigned to a treatment, placebo, or control group. The treatment group was given LLLT, which consisted of shining low-level lasers onto the outer ear, head, and neck. Each laser treatment lasted approximately five minutes. Three treatments were applied within the course of one week. A battery of auditory tests was administered immediately before the first treatment and immediately after the third treatment. The battery consisted of pure-tone audiometry, the Connected Speech Test, and transient-evoked otoacoustic emissions. Data were analyzed by comparing pre- and posttest results. No statistically significant differences were found between groups for any of the auditory tests. Additionally, no clinically significant differences were found in any individual subjects. This trial is registered with ClinicalTrials.gov (NCT01820416). Free PMC Article.
Advice from the organo-dynamic approach of tinnitus
[Enseignements de l'approche organo-dynamique de l'acouphène]
Evolution Psychiatrique 2013. (Article in press)

Dauman, N.

Docteur en psychologie, psychologue clinicien, membre associé de la CRPC-CAPS, EA-4050, UFR Sciences humaines et arts, département de psychologie, université de Poitiers, bâtiment A4, 3, rue Théodore-Lefebvre, 86000 Poitiers, France

Objective: In this article, we make a critical analysis of the Traité des Hallucinations by the French psychiatrist Henri Ey (1900-1977) and his organo-dynamic theory, that is focused on the functional pathology in contrast to the delirious hallucination. The analysis is dedicated in particular to the phenomenology of tinnitus (i.e. ringing in the ear[s]) that is currently labelled a "phantom auditory perception" by contemporary neurosciences. Method: The analysis was conducted from a thorough reading of the psychiatric work of Henri Ey, mainly his important "Traité des Hallucinations" (2006), "Études psychiatriques" (2006) and "Neurologie et Psychiatrie" (1998). Following his warning regarding a pathological reality (hallucination) that cannot be seized "by draft and outlines", in this report we address the understanding of the patient's discourse beyond its convergence with the experimental facts. Results: Because he wanted to include in the pathogeny of his treatise the "most elementary one" - e.g. tinnitus in the auditory sense - Henri Ey felt in the conception he did not support himself, that is to compare hallucination to a "kind of" perception. Having distinguished the delirious from the functional hallucinations (that correlate with sensory deprivation), he could not avoid reifying them within the sensory deficit, leading again to the concept of perception. This remark can be applied to the contemporary neurophysiological model of the "phantom auditory perception", which also casts the patient's discourse on a frame with its relativity and proportions that belong to the field of perception ("elementary" vs. "complex" phenomena). Discussion: The paradox of drafting functional hallucination as an elementary perception supports a new perspective on suffering from tinnitus, that is not restricted to an understanding of the convergence between the subjective discourse and a sensory deficit. Beyond a reification of the subjective indication arising inside the body (i.e. tinnitus), the study of the individual enunciation of the suffering appears on the horizon of the organo-dynamic theory. A psychodynamic approach of this new issue on tinnitus has been supported by the author and a colleague. Conclusions: Whilst today the magnetic resonance imaging seems to nullify the intersubjective reality, by showing visual correlates of this intangible phenomenon, Henri Ey allows us to recognize a surprisingly modern requirement: a psychotherapeutic listening to tinnitus patients has to be iconoclastic. If the aim is to set-up an individual dialogue with the tinnitus sufferer, the clinician must remove in his mind the images he created about it. © 2013 Elsevier Masson SAS. All rights reserved.
Tinnitus: causes and clinical management.

Langguth B, Kreuzer PM, Kleinjung T, De Ridder D.
Department of Psychiatry and Psychotherapy, University of Regensburg, Regensburg, Germany; Interdisciplinary Tinnitus Center, University of Regensburg, Regensburg, Germany. Electronic address: berthold.langguth@medbo.de.

Tinnitus is the perception of sound in the absence of a corresponding external acoustic stimulus. With prevalence ranging from 10% to 15%, tinnitus is a common disorder. Many people habituate to the phantom sound, but tinnitus severely impairs quality of life of about 1-2% of all people. Tinnitus has traditionally been regarded as an otological disorder, but advances in neuroimaging methods and development of animal models have increasingly shifted the perspective towards its neuronal correlates. Increased neuronal firing rate, enhanced neuronal synchrony, and changes in the tonotopic organisation are recorded in central auditory pathways in reaction to deprived auditory input and represent-together with changes in non-auditory brain areas-the neuronal correlate of tinnitus. Assessment of patients includes a detailed case history, measurement of hearing function, quantification of tinnitus severity, and identification of causal factors, associated symptoms, and comorbidities. Most widely used treatments for tinnitus involve counselling, and best evidence is available for cognitive behavioural therapy. New pathophysiological insights have prompted the development of innovative brain-based treatment approaches to directly target the neuronal correlates of tinnitus. Copyright © 2013 Elsevier Ltd. All rights reserved.

Tinnitus.

Baguley D, McFerran D, Hall D.
Cambridge University Hospitals NHS Foundation Trust, Cambridge, UK; Anglia Ruskin University, Cambridge, UK. Electronic address: dmb29@cam.ac.uk.

Tinnitus is a common medical symptom that can be debilitating. Risk factors include hearing loss, ototoxic medication, head injury, and depression. At presentation, the possibilities of otological disease, anxiety, and depression should be considered. No effective drug treatments are available, although much research is underway into mechanisms and possible treatments. Surgical intervention for any otological pathology associated with tinnitus might be effective for that condition, but the tinnitus can persist. Available treatments include hearing aids when hearing loss is identified (even mild or unilateral), wide-band sound therapy, and counselling. Cognitive behavioural therapy (CBT) is indicated for some patients, but availability of tinnitus-specific CBT in the UK is poor. The evidence base is strongest for a combination of sound therapy and CBT-based counselling, although clinical trials are constrained by the heterogeneity of patients with tinnitus. Copyright © 2013 Elsevier Ltd. All rights reserved.
Role of attention in the generation and modulation of tinnitus.

Roberts LE, Husain FT, Eggermont JJ.
Department of Psychology, Neuroscience, and Behaviour, McMaster University, 1280 Main Street West, Hamilton, Ontario L8S 4K1, Canada. Electronic address: roberts@mcmaster.ca.

Neural mechanisms that detect changes in the auditory environment appear to rely on processes that predict sensory state. Here we propose that in tinnitus there is a disparity between what the brain predicts it should be hearing (this prediction based on aberrant neural activity occurring in cortical frequency regions affected by hearing loss and underlying the tinnitus percept) and the acoustic information that is delivered to the brain by the damaged cochlea. The disparity between the predicted and delivered inputs activates a system for auditory attention that facilitates through subcortical neuromodulatory systems neuroplastic changes that contribute to the generation of tinnitus. We review behavioral and functional brain imaging evidence for persisting auditory attention in tinnitus and present a qualitative model for how attention operates in normal hearing and may be triggered in tinnitus accompanied by hearing loss. The viewpoint has implications for the role of cochlear pathology in tinnitus, for neural plasticity and the contribution of forebrain neuromodulatory systems in tinnitus, and for tinnitus management and treatment. Copyright © 2013 Elsevier Ltd. All rights reserved.

Trauma-Associated Tinnitus.
J Head Trauma Rehabil. 2013 Aug 26. [Epub ahead of print]

Kreuzer PM, Landgrebe M, Vielsmeier V, Kleinjung T, De Ridder D, Langguth B.

Departments of Psychiatry and Psychotherapy (Drs Kreuzer, Landgrebe, and Langguth) and Otolaryngology (Dr Vielsmeier), University of Regensburg, Regensburg, Germany; Department of Psychiatry, Psychosomatic Medicine and Psychotherapy, Social Foundation Bamberg, Bamberg, Germany (Dr Landgrebe); Department of Otolaryngology, University of Zurich, Zurich, Switzerland (Dr Kleinjung); Brain Research Center Antwerp for Innovative & Interdisciplinary Neuromodulation, Antwerp, Belgium; and Unit of Neurosurgery, Department of Surgical Sciences, Dunedin School of Medicine, University of Otago, Dunedin, New Zealand (Dr De Ridder).

BACKGROUND: Up to 53% of individuals suffering from traumatic brain injuries develop tinnitus. OBJECTIVE: To review the current literature on trauma-associated tinnitus in order to provide orientation for the clinical management of patients with trauma-associated tinnitus. MATERIALS: A systematic literature search has been conducted in PubMed database applying the search terms posttraumatic tinnitus and trauma-associated tinnitus. Results have been complemented by related studies, book chapters, and the authors' clinical experience. RESULTS: Not only mechanical, pressure-related, or noise-related head traumata but also neck injuries and emotional trauma can cause tinnitus. Exact diagnosis is essential. Disorders such as ossicular chain disruption, traumatic eardrum perforation, or perilymphatic fistula can be surgically treated. It should also be considered that pulsatile tinnitus can be a sign of life-threatening disorders such as carotid cavernous fistulas, arteriovenous malformations, and carotid dissections. Also, posttraumatic stress disorder should be taken into consideration as a potential contributing factor. CONCLUSIONS: There is an evident mismatch between the high incidence of trauma-associated tinnitus and scarce literature on the topic. A consistent and-at best-standardized assessment of tinnitus- and hearing-related sequelae of trauma is recommended both for the improvement of clinical care and for a deeper understanding of the various pathophysiologica l mechanisms of trauma-associated tinnitus.
Advances in the neurobiology of hearing disorders: Recent developments regarding the basis of tinnitus and hyperacusis.

Knipper M, Van Dijk P, Nunes I, Rüttiger L, Zimmermann U.

University of Tübingen, Department of Otolaryngology, Head and Neck Surgery, Tübingen Hearing Research Centre (THRC), Molecular Physiology of Hearing, Tübingen, Germany.

The prevalence of hearing problems in the Western world has, due to aging of the population, doubled over the past 30 years. Thereby, noise-induced hearing loss is an important factor that worsens over time in addition to age-related hearing loss. Hearing loss is usually measured as an elevation of a person's hearing thresholds, expressed in decibel (dB). However, recent animal studies have unraveled a type of permanent cochlear damage, without an elevation of hearing thresholds. This subtle damage is linked to a permanent and progressive degeneration of auditory fibers that occurs in association with damage of the inner hair cell synapse. Afferent neuronal degeneration has been suggested to be involved in hyperacusis (over sensitivity to sound) and tinnitus (a phantom sound percept). Hyperacusis and tinnitus are potentially devastating conditions that are still incurable. The main risk factors to develop tinnitus or hyperacusis are hearing loss, social stress and age. Both tinnitus and hyperacusis have been discussed in the context of a pathological increased response gain in subcortical brain regions as a reaction to deprivation of sensory input. Novel studies confirm the involvement of peripheral deafferentation for tinnitus and hyperacusis, but suggest that the disorder results from different brain responses to different degrees of deafferentation: while tinnitus may arise as a failure of the brain to adapt to deprived peripheral input, hyperacusis may result from an 'over-adaptive' increase in response gain. Moreover, moderate and high stress levels at the time of acoustic trauma have been suggested to play a pivotal role in the vulnerability of the cochlea to acoustic damage and therefore for the development of tinnitus and hyperacusis. Copyright © 2013 The Authors. Published by Elsevier Ltd.. All rights reserved.

Evaluation and Treatment of Tinnitus: Comparative Effectiveness [Internet].


OBJECTIVES: A review was undertaken to evaluate the peer-reviewed literature on three areas of tinnitus management for the following Key Questions (KQs): (1) measures used to assess patients for management needs (KQ1); (2) effectiveness of treatments (KQ2); and (3) identification of prognostic factors (KQ3). DATA SOURCES: MEDLINE®, Embase®, CINAHL®, PsycINFO®, AMED©, and Cochrane CENTRAL were searched from January 1970 to June 2012. An extensive grey literature search, which included documents from regulatory and tinnitus-related organizations, was also undertaken. REVIEW METHODS: Standardized systematic review methodology was employed. Eligibility criteria included English-language studies of adults with subjective idiopathic (nonpulsatile) tinnitus; excluded studies involved tinnitus as the result of middle-ear pathologies or focused on methods to determine psychosomatic tinnitus. For KQ2, all pharmacological/food supplement, medical/surgical, sound/technological, and psychological/behavioral interventions aimed at ameliorating tinnitus symptoms were eligible (except stapedectomy or tympanoplasty). Randomized controlled trials with placebo controls or head-to-head trials were eligible for all KQs. RESULTS: From 9,725 citations, 52 eligible publications were extracted for data. None were eligible for KQ1 or KQ3. From the 52 publications eligible for KQ2, 17 evaluated pharmacological interventions; 11 evaluated medical interventions (low-level laser, acupuncture, transcranial magnetic stimulation); 5 evaluated sound technologies; and 19 evaluated psycholocal/behavioral interventions. Data on adverse effects were generally poorly collected and reported. CONCLUSIONS: There is low strength of evidence (SOE) indicating that cognitive behavioral therapy interventions improve tinnitus-specific quality of life relative to inactive controls. For pharmacological interventions, SOE is low for improvements to subjective loudness from neurotransmitter drugs versus placebo; insufficient for antidepressants, other drugs, and

57 back to content
food supplements with respect to subjective loudness; and insufficient for all other outcomes. There is insufficient SOE to suggest that medical interventions improve outcomes relative to inactive controls; sleep and global quality of life were not evaluated for medical interventions. The SOE for the adverse effect of sedation in pharmacological studies was judged insufficient. Future research should address the substantial gaps identified for KQ1 and KQ3. For KQ2, future research should concentrate on improving collection of adverse effects, calculating sample size, and specifying doses for interventions. Free full text.

Tinnitus: diagnostic approach leading to treatment.

Levine RA.

Department of Otolaryngology, Tel Aviv Sourasky (Ichilov) Medical Center, Tel Aviv, Israel.

Optimal care for a patient with tinnitus begins with identifying the cause of the tinnitus. Once the cause has been identified then an appropriate treatment plan can be initiated. In this article, the author reviews how to identify the tinnitus etiology and its treatment. The workup begins with the patient's description of the percept because in some cases, the quality of the tinnitus will make the diagnosis (e.g., clicking, which is readily suppressed pharmacologically); in other cases, it will give direction in the diagnostic evaluation (e.g., pulsatile). With the exception of a small dural arteriovenous malformation, the source of objective pulsatile tinnitus can be determined without conventional cerebral angiography. If the diagnostic workup is unrevealing and the pulsations are not suppressed with somatic testing, then eighth nerve vascular compression becomes the likely etiology, especially if there is some clicking also heard, no matter how minor. The two major causes of tinnitus are hearing loss and myofascial disorders of the head and neck. Moreover, the two can combine and cause tinnitus even though either condition alone would not have caused tinnitus. Although the tinnitus of hearing loss is not easily treatable, the tinnitus from myofascial disorders is often responsive to an optimized myofascial treatment program. Hyperacusis, a frequent accompaniment of tinnitus, and its treatment are discussed. Thieme Medical Publishers 333 Seventh Avenue, New York, NY 10001, USA.
XIII Others

Adolescents' reported hearing symptoms and attitudes toward loud music.

Landälv D, Malmström L, Widén SE.

School of Health and Medical Sciences, University of Örebro, Swedish Institute for Disability Research, Örebro, Sweden.

The aim of the present study was to compare the adolescents' attitudes toward loud music in relation to a set of self-perceived auditory symptoms and psychological variables such as norms, preparedness to take risks and risk-judgment in noisy situations. A questionnaire on hearing and preventive behavior was distributed to 281 upper secondary school students aged 15-19 years. The questionnaire included youth attitude to noise scale, questions about perceived hearing symptoms such as tinnitus and sound sensitivity and finally statements on perceived behavioral norms regarding hearing protection use, risk-taking and risk-judgment in noisy settings. Self-perceived auditory symptoms such as sound sensitivity and permanent tinnitus had a significant relationship with less tolerant attitudes toward loud music. Permanent tinnitus and sound sensitivity together accounted for 15.9% of the variation in attitudes toward loud music. Together with the psychological variables norms, preparedness to take risks and risk-judgment 48.0% of the variation in attitudes could be explained. Although perceived hearing symptoms (sound sensitivity and permanent tinnitus) was associated with less tolerant attitudes toward loud music, psychological variables such as norms, preparedness to take risks and risk-judgment were found to be more strongly associated with attitudes toward loud music and should therefore be considered more in future preventive work. Health promotive strategies should focus on changing not merely individual attitudes, but also societal norms and regulations in order to decrease noise induced auditory symptoms among adolescents.

Epidemiology of Noise-Induced Tinnitus and the Attitudes and Beliefs towards Noise and Hearing Protection in Adolescents.


University Department of Otorhinolaryngology and Head & Neck Surgery, Antwerp University Hospital, Edegem, Belgium; Faculty of Medicine, Campus Drie Eiken, Antwerp University, Wilrijk, Belgium; Tinnitus Research Initiative Centre (TRI), Antwerp University Hospital, Edegem, Belgium.

BACKGROUND AND OBJECTIVES: Previous research showed an increase of noise-induced symptoms in adolescents. Permanent tinnitus as a consequence of loud music exposure is usually considered as noise-induced damage. The objective was to perform an epidemiological study in order to obtain prevalence data of permanent noise-induced tinnitus as well as temporary tinnitus following noise exposure in a young population. In addition the attitudes and beliefs towards noise and hearing protection were evaluated in order to explain the use/non-use of hearing protection in a young population. METHODS: A questionnaire was completed by 3892 high school students (mean age: 16.64 years old, SD: 1.29 years). The prevalence of temporary and permanent tinnitus was assessed. In addition the 'Youth Attitudes to Noise Scale' and the 'Beliefs About Hearing Protection and Hearing Loss' were used in order to assess the attitudes and beliefs towards noise and hearing protection respectively. RESULTS: The prevalence of temporary noise-induced tinnitus and permanent tinnitus in high school students was respectively 74.9% and 18.3%. An increasing prevalence of temporary tinnitus with age was present. Most students had a 'neutral attitude' towards loud music and the use of hearing protection was minimal (4.7%). The limited use of hearing protection is explained by a logistic regression analysis showing the relations between certain parameters and the use of hearing protection. CONCLUSIONS: Despite the very high prevalence of tinnitus in such a young population, the rate of hearing protection use and the knowledge about the risks of loud music is extremely low. Future preventive campaigns should focus more on tinnitus as a warning signal for noise-induced damage and emphasize that also temporary symptoms can result in permanent noise-induced damage. Free PMC Article.

Loprinzi PD, Lee H, Gilham B, Cardinal BJ.

Department of Exercise Science, Lansing School of Nursing and Health Sciences, Bellarmine University, 2001 Newburg Road, Louisville, KY 40205, USA. ploprinzi@bellarmine.edu.

PURPOSE: Internet-based claims suggest that physical activity may help to relieve tinnitus symptoms. The purpose of this study was to empirically investigate the association between accelerometer-assessed physical activity and tinnitus (i.e., ringing, roaring, or buzzing in the ears). METHOD: Data were obtained from the 2005-2006 National Health and Nutrition Examination Survey on 963 adolescents (aged 12-19 years old) and 473 older adults (aged 70-85 years old). Physical activity was measured using an accelerometer, and participants were asked several tinnitus-related questions. RESULTS: The weighted prevalence of tinnitus was 8.9% and 25.3% for adolescents and older adults, respectively. For every 1-min increase in moderate-to-vigorous physical activity, adolescents were 4% less likely to have tinnitus lasting more than 3 months compared with less than 3 months (OR = 0.96, 95% CI [0.93, 0.99]). For older adults with hypertension, for every 60-min increase in light-intensity physical activity, they were 21% less likely to have tinnitus compared with not having tinnitus (OR = 0.790, 95% CI [0.649, 0.963]). CONCLUSION: Overall, we conclude that physical activity was associated with tinnitus status in a nationally representative sample of adolescents and older adults. If additional studies confirm these findings, then audiologists and other hearing specialists are encouraged to promote physical activity among their patients to help treat and prevent tinnitus.

Transient auditory dysfunction: A description and study of prevalence.

Almond LM, Patel K, Rejali D.

Department of Otolaryngology, University Hospital Coventry and Warwickshire, Clifford Bridge Rd., Binley, Coventry, CV2 2DX UK. mxa891@hotmail.com.

Transient auditory dysfunction (TAD) is a previously undescribed symptom complex of unknown cause. It is characterized by short-lasting sensorineural hearing loss (unilateral or bilateral), it is associated with tinnitus, it resolves completely within minutes, and it is not accompanied by vestibular symptoms. We conducted a cross-sectional prospective study to define TAD, find its prevalence, and discuss its significance. Two hundred healthy subjects between the ages of 16 and 49 years were surveyed using a questionnaire. Of these subjects, 41 (20.5%) reported experiencing symptoms of TAD. The mean number of episodes was 5.9 times per month, the mean duration was 41 seconds, and 80% experienced concomitant tinnitus. We conclude that TAD is a common finding in a healthy population. This may have implications for the pathogenesis of sudden-onset sensorineural hearing loss. Further longitudinal studies and detailed audiologic evaluation of patients with TAD are required to ascertain the significance, etiology, and pathophysiology of this condition.
A preliminary study on the relationship between central auditory processing and childhood primary headaches in the intercritical phase.


1 Headache and Drug Abuse Inter-Dep Research Centre, University of Modena and Reggio Emilia, via del Pozzo 71, Modena, Italy; 2 Child Neurology and Psychiatry Unit, University of Modena and Reggio Emilia, via del Pozzo 71, 41124 Modena, Italy; 3 Audiology Unit, Department of Diagnostic Medicine, Clinical and Public Health, University of Modena and Reggio Emilia, via del Pozzo 71, Modena, Italy; 4 Otolaryngology Department, Hospital of Carpi, Via Guido Molinari 2, Carpi, Italy.

BACKGROUND: Recently, an increasing number of articles have appeared on central auditory processing disorders, but in the literature there is only one study that evaluated the possible correlation between migraine in the critical phase and central auditory processing. The aim of our study was to assess the correlation between auditory processing information and childhood primary headaches in the intercritical phase. METHODS: This is an observational study. We enrolled 54 patients, 30 with primary headache (migraine and tension headache) and 24 normal controls, matched for sex and age. The mean age at first observation was 9 years 10 months; the duration of observational follow-up was 2 years. Both groups had normal audiological and neurological profiles, normal peripheral hearing acuity and normal cognitive and behavioral skills. We excluded patients who had undergone pharmacological prophylactic treatment for headaches in the 6 months preceding the study and subjects with a frequency of headache lower than one every two months. After enrolment, both groups were analyzed with a computerized test battery for Speech Perception Tests in silence and in noise background to assess speech perception disabilities. In addition, with a test battery of Speech Perception Tests, we compared patients with migraines and tension-type headaches. The non-parametric chi2 test, the Mann--Whitney U-test and the Wilcoxon signed ranks test were used for statistical analysis. RESULTS: Our results showed that patients with primary headache (migraine and tension headache), had a deficit of auditory processing in noisy background compared to control cases, but we found no significant differences when we compared patients with migraine and tension-type headache. CONCLUSIONS: This is a work in progress and further studies are needed to assess the relationship between the impairment of auditory processing and primary headache, not only to improve the diagnostic approach to primary headache, but also to improve therapeutic intervention. Free full text.
**XIV Case Reports**

**Carotico-cavernous fistula: An educational case.**

Martin S, Teo M, Bhattacharya J, Alakandy L.

Department of Neurosurgery, Institute of Neurological Science, Glasgow G51 4TF, United Kingdom.
Electronic address: seanmartin@doctors.org.uk.

INTRODUCTION: We present a case of direct carotico-cavernous fistula (CCF) and its successful treatment. PRESENTATION OF CASE: A 55-year-old male presented with left eye discomfort, diplopia and pulsatile tinnitus. He had a recent history of head injury. Examination showed proptosis, chemosis, orbital bruising, and abducens nerve palsy. Digital subtraction angiography confirmed CCF, which was managed endovascularly. The patient recovered fully after treatment. DISCUSSION: CCF has a variety of presenting clinical signs, imaging manifestations, and treatment options available. CONCLUSION: CCF is a rare and dangerous neurological disorder that should be promptly diagnosed and treated. Copyright © 2013 The Authors. Published by Elsevier Ltd. All rights reserved.

**Endovascular treatment for traumatic scalp arteriovenous fistulas: results with Onyx embolization.**


Division of NeuroInterventional Surgery, Baptist Cardiac and Vascular Institute and Baptist Neuroscience Center, Miami, Florida, USA.

BACKGROUND: Arteriovenous fistulas of the scalp (S-AVFs) are rare lesions and may occur spontaneously or secondary to trauma. The use of Onyx for the treatment of S-AVFs is not well established at this time. We discuss three cases of traumatic S-AVFs treated successfully with Onyx embolization alone or in association with coils. METHODS: The database of patients treated at the Baptist Cardiac and Vascular Institute, Miami, Florida, was reviewed. All patients with traumatic S-AVFs treated with Onyx were included. RESULTS: Two men and one woman with progressive enlarging pulsatile mass with bruit or tinnitus had angiographic evidence of S-AVF and were treated. In two patients the S-AVFs were secondary to hair transplantation. They were treated with Onyx-18 embolization as the single treatment modality. One patient with S-AVF resulting from temporomandibular joint arthroscopy was treated with Onyx-34 and subsequent Onyx-18 embolization. In one patient, transarterial microcatheterization and injection of Onyx-18 was performed. In another patient, the intra-arterial approach was prevented by arterial vessel tortuosity. Therefore, access to the fistula was obtained through direct puncture of a large frontal vein; contrast injection confirmed the positioning of the needle within the draining vein of the AVF and Onyx-18 was then injected while the outflow vein was compressed. In the third patient in this series, coils were deployed to allow safer and more controlled injection of Onyx-34. No procedure related complications were noted. Post-embolization angiography demonstrated successful and complete occlusion of the AVF immediately after treatment. Follow-up revealed complete resolution of the symptoms. CONCLUSIONS: Our experience in this small series indicates that endovascular treatment of S-AVFs with Onyx is rapid, safe, and highly effective.
Inflammatory myofibroblastic tumor of the temporal bone presenting with pulsatile tinnitus: a case report.
Zhou X, Liu T, Chen Z, Zhang Z, Xing G.

Department of Otolaryngology, First Affiliated Hospital of Nanjing Medical University, 300 Guangzhou Road, Nanjing, 210029, China. xing-gq@163.com.

INTRODUCTION: Inflammatory myofibroblastic tumor of the temporal bone is an unusual but distinct disease entity. The most common presenting symptoms are otalgia, otorrhea, hearing loss, facial palsy, and vertigo. We describe here what we believe to be the first reported case of a patient presenting with persistent pulsatile tinnitus. The clinical features, radiological and histopathologic findings, and treatment outcomes of the patient are presented. CASE PRESENTATION: A 59-year-old woman of Chinese Han origin presented with complaints of left-sided pulsatile tinnitus and progressive hearing loss for several years. Clinical evaluations revealed a reddish mass behind the intact tympanic membrane, and a moderately severe conductive hearing loss in the left ear. The computed tomographic imaging of the temporal bone demonstrated a slightly ill-defined left middle ear soft tissue mass involving the posterior portion of the mesotympanum and epitympanum, and the mastoid antrum. The patient underwent surgical excision of the lesion which subsequently resolved her symptoms. Postoperative pathology was consistent with an inflammatory myofibroblastic tumor. CONCLUSIONS: An inflammatory myofibroblastic tumor of the temporal bone can present clinically with pulsatile tinnitus and masquerade as venous hum or vascular tumors of the middle ear; therefore, it should be included in the differential diagnosis of pulsatile tinnitus.

Free full text.

Varix of the retromandibular vein within the parotid gland: case study.
Wali GN, Mawby TA, Sheerin F, Milford CA.

Department of ENT, John Radcliffe Hospital, Oxford, UK.

Objective: To report a case of varix of the retromandibular vein within the parotid gland. Methods: Case report, and discussion of the appropriate selection and use of radiological investigation techniques. Results: A 64-year-old lady who presented with unilateral tinnitus underwent a magnetic resonance imaging scan to exclude a vestibular schwannoma. The magnetic resonance scout images revealed an incidental finding of a hyper-echoic mass within the parotid gland. The mass was most consistent with a pleomorphic adenoma. Ultrasound-guided fine needle aspiration cytology was arranged; the ultrasound identified the mass as a varix of the retromandibular vein and fine needle aspiration cytology was not performed. Conclusion: A varix of the retromandibular vein is a very rare cause of a parotid mass. Appropriate radiological investigations can prevent unnecessary invasive investigations or procedures.

Langerhans cell histiocytosis in bilateral mastoid cavity.
Bozdemir K, Tarlak B, Cakar H, Doblan A, Kutluhan A, Dilek I, Adıyaman Süngü N.

Ankara Ataturk Training and Research Hospital ENT, Department Bilkent, 06800 Ankara, Turkey.

A 39-year-old male was admitted to our clinic with symptoms of headache, dizziness, nausea, otalgia, otorrhea, tinnitus, and hearing loss in both ears for 3 weeks. Physical examination revealed edema in the tympanic membrane and external ear canal, and pain by palpation in the mastoid area bilaterally. There was no nystagmus, and the rest of the physical examination was otherwise normal. Temporal bone high resolution computed tomography (CT) showed a lesion causing erosion in the mastoid cortex, tegmen tympani, ossicles, and in the bone covering the sigmoid sinus bilaterally. There was also erosion in the superior semicircular canal and petrous bone on the left side. Cortical mastoidectomy was performed under general anesthesia. Histopathologic examination of the tissue revealed Langerhans cell histiocytosis (LCH). In this paper a case with LCH, presenting with bilateral mastoid involvement which has been rarely reported in the literature, is discussed with the existing literature. Free PMC Article.
Two case of Meniere's disease presenting with downbeating nystagmus

Taki, M. a, Hasegawa, T. b, Okamato, S. a, Nakamura, T. a, Adachi, N. c, Fujita, T. d, Sakaguchi, H. a, Hisa, Y. a

a Department of Otolaryngology-Head and Neck Surgery, Kyoto Prefectural University of Medicine, Japan; b Department of Otolaryngology, Kyoto Prefectural Yosanoumi Hospital, Japan; c Department of Otolaryngology, Maizuru Medical Center, Japan; d Department of Otolaryngology, Omihachiman Community Medical Center, Japan.

Downbeat nystagmus (DBN) is commonly caused by central lesions, e.g., vestibulocerebellar and brainstem lesions, and there are few reports on DBN caused by peripheral lesions. We report two cases of Meniere's disease who presented with DBN and fluctuating low-tone sensorineural hearing loss. Case 1: a 55-year-old female. The patient was admitted to our hospital in September 20XX because of a vertigo attack. She exhibited rightward horizontal nystagmus in the supine position, however, the positioning test triggered DBN, which changed later to rightward horizontal nystagmus. There were no apparent neurological or neuro-otological abnormalities. Two days later, pure-tone audiometry showed low-tone sensorineural hearing loss in the left ear. Magnetic resonance imaging (MRI) revealed no abnormal findings. Although steroid and isosorbide administrations were not effective, the symptoms resolved completely with the administration of diazepam. Case 2: A 26-year-old female. In August 20XX, the patient consulted a neighborhood clinic for hearing loss and tinnitus in the left ear. She presented with a history of repeated hearing loss and positional DBN and was referred to our hospital for further examination. Puretone audiometry showed low-tone hearing loss in the left ear. Magnetic resonance imaging (MRI) revealed no abnormal findings. Although steroid and isosorbide administrations were not effective, the symptoms resolved completely with the administration of diazepam. Thus, we encountered two cases of Meniere's disease presenting with DBN. The positional DBN in both cases was suspected to be caused by endolymphatic hydrops in the saccule and anterior semicircular canal.

Solitary intracranial osteoma with attachment to the falx: a case report.
World J Surg Oncol. 2013 Sep 8;11(1):221. [Epub ahead of print]

Chen SM, Chuang CC, Toh CH, Jung SM, Lui TN.

Intracranial osteomas are uncommon lesions that usually arise from the inner table of the cranium. There are few reports in the literature of intracranial osteomas with meninges attachment and without direct relation with the skull bone; these osteomas were mostly attached with dura. We report a rare osteoma with falx attachment. Case: A 64-year-old woman presented with a 3-month history of intermittent tinnitus and dizziness. The scout film of petrous bone computed tomography scan revealed a high-density lesion in the frontal area. Magnetic resonance imaging showed a 2.5-cm mass attached to the surface of the falx in the right frontal parasagittal area. The patient underwent right frontal craniotomy, and a bony hard mass was found located in the right frontal parasagittal region extra-axially, with its medial surface attached to the falx. It could not be broken down by the cavitron ultrasonic surgical aspirator or even the cutting loop and was detached from the falx and removed in one piece. Histopathological examination showed a nodule with bony trabeculae and bone marrow tissue, compatible with osteoma. The postoperative course was uneventful, and the patient was discharged from the hospital with no neurological deficits one week after operation. CONCLUSIONS: This is the first case report in the English literature of an intracranial osteoma arising from the falx. Because of their slow growth and their locations in silent brain areas, intracranial osteomas are usually diagnosed incidentally. Surgical resection is the primary treatment choice.
Vestibular paroxysmia associated with paroxysmal pulsatile tinnitus: a case report and review of the literature.

Chang TP, Wu YC, Hsu YC.
Department of Neurology, Neuro-Medical Scientific Center, Buddhist Tzu Chi General Hospital, Taichung Branch, Taiwan.

Purpose: Vestibular paroxysmia is defined as paroxysmal, brief, and carbamazepine-responsive vertigo. Although neurovascular cross-compression (NVCC) of the vestibulocochlear nerve is believed to be the cause of vestibular paroxysmia, the mechanism remains controversial. Herein, we describe the case of a man with NVCC who presented with paroxysmal vertigo associated with paroxysmal pulsatile tinnitus. Case Report: A 68-year-old man presented with paroxysmal vertigo for one month. Paroxysmal pulsatile tinnitus in the right ear occurred simultaneously with the vertigo. Magnetic resonance imaging demonstrated that the right anterior inferior cerebellar artery was compressing the right vestibulocochlear nerve. The vertigo and tinnitus completely disappeared within one week after treatment with carbamazepine. Conclusion: The pulsatile nature of the patient's tinnitus implied that the auditory nerve was being compressed by a pulsating artery and was found to consolidate the causal relationship between NVCC and vestibular paroxysmia. Free Article.

Department of Neuroradiology, S. Salvatore Hospital, University of L'Aquila, Italy - alessiacat@tiscali.it.

Rosai-Dorfman disease (RDD) was firstly described in 1969 as a benign proliferative disorder of histiocytes with systemic symptoms and lymphadenopathy. This disease is of uncertain pathogenesis and mostly occurs in children and young adults. The typical clinical features of RDD include bilateral painless cervical lymphadenopathy, but extranodal involvement may also be present. The most common extranodal sites include organs such as the respiratory tract, skin, nasal cavity, orbit and bone. Isolated central nervous system (CNS) manifestations are extremely rare. In case of CNS involvement, the commonest imaging findings are dural-based extra-axial enhancing masses. We describe a case of intracranial RDD mimicking multiple meningiomas both clinically and radiologically in a 57-year-old man presenting with a six-year history of progressive right visual and hearing loss and tinnitus. In cases of multiple extra-axial lesions it is worth bearing in mind the possible differential diagnosis for intracranial RDD and eventually propose to the patient further investigations.
**Paraganglioma presenting as cholesterol granuloma of the petrous apex.**

Ear Nose Throat J. 2013 Sep;92(9):430-4.

Heman-Ackah SE, Huang TC.

Department of Otolaryngology-Head and Neck Surgery, University of Minnesota, MMC 396, 420 Delaware Ave., SE, Minneapolis, MN 55455, USA.

We report the unique finding of a petrous apex cholesterol granuloma associated with a paraganglioma, also known as a glomus jugulare tumor, in a 52-year-old woman who presented to our department with pulsatile tinnitus, hearing loss, aural fullness, and disequilibrium. She had been treated for a petrous apex cholesterol granuloma 20 years earlier, at which time she had undergone drainage of the granuloma via subtotal petrous apicectomy. When she came to our facility approximately 20 years later, she had signs and symptoms consistent with a jugular paraganglioma, which was likely to have been present at the time of her initial presentation for the cholesterol granuloma. In fact, microscopic bleeding from the paraganglioma might have led to the formation of the cholesterol granuloma. The metachronous presentation of these two entities, which to our knowledge has not been reported previously in the literature, indicates the potential association of paragangliomas with the formation of cholesterol granulomas of the petrous apex.

**Bilateral persistent trigeminal arteries with unilateral trigeminal artery to cavernous sinus fistula. A case report.**


Chen D, Chen CJ, Chen JJ, Tseng YC, Hsu HL, Ku JW.

Department of Medical Imaging, Taipei Medical University, Shuang-Ho Hospital; New Taipei City, Taiwan - E-mail: janwenku@gmail.com.

A 59-year-old man who denied a history of trauma presented with left pulsatile tinnitus and left orbital swelling for six months. Digital subtraction angiography showed a left persistent trigeminal artery (PTA) with a trigeminal artery to cavernous sinus (trigeminal-cavernous sinus) fistula and a right PTA. Transarterial detachable coil embolization of the left trigeminal-cavernous sinus fistula was performed, and the symptoms subsided. There has been no report of bilateral PTAs with a spontaneous fistula connected from one PTA to the ipsilateral cavernous sinus. This paper reports such a rare circumstance.

**Musical hallucinations and forgotten tunes - case report and brief literature review.**


Vitorovic D, Biller J.

Department of Neurology, Stritch School of Medicine, Loyola University Chicago , Maywood, IL , USA.

Musical hallucinations represent a specific form of auditory hallucinations whereby patients experience formed music without an external source. We describe a 60-year-old woman with history of bilateral hearing impairment and tinnitus who experienced both recognizable and non-recognizable songs. Curiously, she was able to reproduce non-recognizable songs in a way that could be recognized by others. This phenomenon is in line with current understanding that musical hallucinations represent abnormal activity in the auditory associative cortices, raising intriguing questions regarding memory, forgetting, and access to lost memories. Free PMC Article.
Susac syndrome in the absence of encephalopathy and normal MRI.

Owen C, Garikipati V, Weir N.
Southampton General Hospital.

A 21 year-old young lady was referred to ophthalmology with visual disturbance in the right eye. Two weeks prior she had nausea and vertigo and was thought to have an ear infection. She then suffered from right sided hearing loss, tinnitus, sickness, frontal headaches and a few days later awoke with a right visual defect. Examination showed a right inferior visual field loss, branch retinal artery occlusions and visual acuity of 6/36. Neurological review revealed a right sensorineural hearing loss and there was no cognitive impairment. Fluorescein angiogram confirmed branched retinal artery occlusions and cotton wool spots felt unlikely to be due to emboli and more in keeping with a vasculopathy. Investigations including transthoracic echocardiogram, carotid dopplers, thoracic MR angiography, MR brain with venography and autoimmue screen were normal or negative. Audiology confirmed low-frequency hearing loss in the right ear. The combination of branch retinal artery occlusions and sensorineural hearing loss was indicative of Susac syndrome. She was treated with intravenous pulsed steroid followed by oral Prednisolone and Azathioprine. Her vision on the right improved to 6/9 with no change in hearing and she remains under follow-up. Susac syndrome is an endothelial vasculopathy and consists of the well known triad of branched retinal artery occlusion, sensorineural hearing loss and encephalopathy with typical MRI changes. All three components need not be present, especially in the early stages of disease. This patient represents a forme fruste of Susac syndrome with absence of obvious encephalopathy and with normal MRI. Prompt diagnosis and treatment in the early stages is needed to prevent further morbidity.

Sudden Bilateral Sensorineural Hearing Loss Associated with HLA A1-B8-DR3 Haplotype.

1st Academic ENT Department, Ahepa University Hospital, Aristotle University, 54006 Thessaloniki, Greece.

Sudden sensorineural hearing loss may be present as a symptom in systemic autoimmune diseases or may occur as a primary disorder without another organ involvement (autoimmune inner ear disease). The diagnosis of autoimmune inner ear disease is still predicated on clinical features, and to date specific diagnostic tests are not available. We report a case of bilateral sudden hearing loss, tinnitus, intense rotatory vertigo, and nausea in a female patient in which the clinical manifestations, in addition to raised levels of circulating immune complexes, antithyroglobulin antibodies, and the presence of the HLA A1-B8-DR3 haplotype, allowed us to hypothesize an autoimmune inner ear disease. Cyclosporine-A immunosuppressive treatment in addition to steroids helped in hearing recovery that occurred progressively with normalization of the hearing function after a five-month treatment. Cyclosporine-A could be proposed as a therapeutic option in case of autoimmune inner ear disease allowing the suspension of corticosteroids that, at high dose, expose patients to potentially serious adverse events. Free PMC Article.
Infliximab for autoimmune inner ear disease: case report and literature review.

Heywood RL, Hadavi S, Donnelly S, Patel N.
Department of Otorhinolaryngology, Whipps Cross University Hospital, London, UK.

Objectives: This study aimed (1) to report the long-term effects of infliximab, a murine monoclonal antibody directed against tumour necrosis factor-α, on autoimmune inner ear disease, and (2) to discuss dilemmas surrounding the long-term management of autoimmune inner ear disease. Case report: A 49-year-old man presented with sudden-onset, left-sided, sensorineural hearing loss, tinnitus and vertigo. He was prescribed oral prednisolone, with benefit. Over several subsequent months, he experienced frequent relapses and progressive deterioration of high-frequency hearing bilaterally. Multiple agents failed to stabilise his condition. Following infliximab treatment, there was a documented and sustained improvement in his hearing and tinnitus. He stopped the treatment after 46 weeks, with rapid relapse of his condition. His hearing recovered quickly again after recommencing infliximab. Conclusion: The benefits of prolonged infliximab use and potential side effects must be balanced against allowing the disease to take its course, with progressive deafness. Randomised controlled trials are required to assess infliximab's optimal duration of use, long-term efficacy and safety in the treatment of autoimmune inner ear disease.

Essential palatal myoclonus following dental surgery: a case report.

Lam JH, Fullarton ME, Bennett AM.

INTRODUCTION: Various presentations of essential palatal myoclonus, a condition characterized by clicking noises and palatal muscle spasm, have been reported in the literature. We are reporting the first case of essential palatal myoclonus following dental treatment. CASE PRESENTATION: A 31-year-old Caucasian man presented to our Ear, Nose and Throat department complaining of objective clicking tinnitus occurring immediately after he had undergone root canal treatment on his right lower third molar 3 months ago. Magnetic resonance imaging of his head revealed no abnormalities in the cerebrum, cerebellum or brainstem making the diagnosis essential palatal myoclonus. He returned a week later, and 20 units of botulinum toxin A (Allergan) were injected into his left tensor veli palatine muscle. He reported an immediate improvement; however, symptoms recurred 6 months later. CONCLUSIONS: Dental treatment can be a trigger of essential palatal myoclonus. Botulinum toxin injections are an effective treatment for short-term relief of symptoms. Free full text.
XV Specific Forms of Tinnitus

Trauma-Associated Tinnitus.
J Head Trauma Rehabil. 2013 Aug 26. [Epub ahead of print]

Kreuzer PM, Landgrebe M, Vielsmeier V, Kleinjung T, De Ridder D, Langguth B.

Departments of Psychiatry and Psychotherapy (Drs Kreuzer, Landgrebe, and Langguth) and Otolaryngology (Dr Vielsmeier), University of Regensburg, Regensburg, Germany; Department of Psychiatry, Psychosomatic Medicine and Psychotherapy, Social Foundation Bamberg, Bamberg, Germany (Dr Landgrebe); Department of Otolaryngology, University of Zurich, Zurich, Switzerland (Dr Kleinjung); Brain Research Center Antwerp for Innovative & Interdisciplinary Neuromodulation, Antwerp, Belgium; and Unit of Neurosurgery, Department of Surgical Sciences, Dunedin School of Medicine, University of Otago, Dunedin, New Zealand (Dr De Ridder).

BACKGROUND: Up to 53% of individuals suffering from traumatic brain injuries develop tinnitus. OBJECTIVE: To review the current literature on trauma-associated tinnitus in order to provide orientation for the clinical management of patients with trauma-associated tinnitus. MATERIALS: A systematic literature search has been conducted in PubMed database applying the search terms posttraumatic tinnitus and trauma-associated tinnitus. Results have been complemented by related studies, book chapters, and the authors' clinical experience. RESULTS: Not only mechanical, pressure-related, or noise-related head traumata but also neck injuries and emotional trauma can cause tinnitus. Exact diagnosis is essential. Disorders such as ossicular chain disruption, traumatic eardrum perforation, or perilymphatic fistula can be surgically treated. It should also be considered that pulsatile tinnitus can be a sign of life-threatening disorders such as carotid cavernous fistulas, arteriovenous malformations, and carotid dissections. Also, posttraumatic stress disorder should be taken into consideration as a potential contributing factor. CONCLUSIONS: There is an evident mismatch between the high incidence of trauma-associated tinnitus and scarce literature on the topic. A consistent and-at best-standardized assessment of tinnitus- and hearing-related sequelae of trauma is recommended both for the improvement of clinical care and for a deeper understanding of the various pathophysiological mechanisms of trauma-associated tinnitus.

Acoustic neuroma observation associated with an increase in symptomatic tinnitus: results of the 2007-2008 Acoustic Neuroma Association survey.

Van Gompel JJ, Patel J, Danner C, Zhang AN, Samy Youssef AA, van Loveren HR, Agazzi S.

Departments of Neurosurgery and Brain Repair.

Object Tinnitus is a known presenting symptom of acoustic neuromas, but little is known about the impact of observation or treatment on tinnitus. Most patients experience improvement with treatment, while others may worsen. Therefore, this study was designed to assess the overall impact of observation and treatment on tinnitus outcome in patients with acoustic tumors. Methods Data from the 2007-2008 Acoustic Neuroma Association survey were used. Tinnitus severity was graded both at presentation and at last follow-up for all patients questioned. This data set was analyzed using the Student t-test and a linear regression model adjusted for possible confounders. Results Overall there were more patients receiving intervention (n = 1138) for their acoustic neuromas than observation (n = 289). Presenting tumor size positively correlated with tinnitus severity score. Regardless of treatment (microsurgery or stereotactic radiosurgery), tinnitus improved at last follow-up and worsened in those who were observed (p = 0.02). When comparing microsurgical options, retrosigmoid and translabyrinthine resection improved tinnitus symptoms (both p < 0.01). Stereotactic radiosurgery had a treatment effect similar to microsurgery. Conclusions Presenting tinnitus severity correlates strongly with tumor size. Furthermore, regardless of treatment, there appears to be an overall reduction in tinnitus severity for all forms of microsurgery and stereotactic radiosurgery. Importantly, observation leads to a worsening in symptomatic tinnitus and therefore should be weighed in the treatment recommendation.
Chronic mountain sickness score was related with health status score but not with hemoglobin levels at high altitudes.


Gonzales GF, Rubio J, Gasco M.

Instituto de Investigaciones de la Altura, Faculty of Sciences and Philosophy, Universidad Peruana Cayetano Heredia, Peru. Electronic address: gustavo.gonzales@upch.pe.

Chronic mountain sickness (CMS) or lack of adaptation to live in high altitudes is related to environmental hypoxia and excessive erythrocytosis (EE) (hemoglobin >21 and >19g/dL for men and women, respectively). Diagnosis of CMS ("Qinghai CMS Score") is based on seven signs/symptoms (breathlessness and/or palpitations, sleep disturbance, cyanosis, dilatation of veins, paresthesia, headache, tinnitus) and the score for EE. The present study was designed to determine the association between hemoglobin, Qinghai CMS score, CMS clinical score (7 signs/symptoms) and Health Status using a health survey composed of 20 items. The rate of CMS (32.6%) was higher than the rate of EE (9.7%; P<0.002). A significant inverse relationship was observed between CMS clinical score and health status score (r=-0.56 for men, and r=-0.55 for women, P<0.01). However, CMS clinical score was not different in groups with different Hb levels. Health status score was significantly higher in subjects without CMS. In conclusion, elevated hemoglobin levels were not associated with elevated CMS clinical score. Copyright © 2013. Published by Elsevier B.V.

Nasopharyngeal carcinoma in children and adolescents in an endemic area: A report of 185 cases.


Yan Z, Xia L, Huang Y, Chen P, Jiang L, Zhang B.

VIP Region, Sun Yat-sen University Cancer Center, 651 Dongfeng East Road, Guangzhou 510060, China.

BACKGROUND: This study aimed to demonstrate the clinical and therapeutic features of nasopharyngeal carcinoma (NPC) in children and adolescents in Southern China, an endemic area. PATIENTS AND METHODS: A total of 185 newly diagnosed NPC patients younger than 21 years old in the Sun Yat-sen University Cancer Center from 1993 to 2011 were retrospectively analyzed. Overall survival (OS) rate estimates and Kaplan-Meier survival curves were calculated. Cox proportional hazard ratios (HRs) were used to identify independent prognostic factors for survival. Chi-square test was used to compare the incidence of sequelae and the stage distribution between different subgroups. RESULTS: Most patients were male (71.4%). The main presenting symptoms were neck mass (44.9%), tinnitus/hearing loss (36.2%), bloody nasal discharge (22.7%), headache (22.2%), and nasal obstruction (20.0%). Stage I, II, III, and IV patients accounted for 1.1%, 8.1%, 43.8%, and 47.0%, respectively, of the total number of patients included in the study. All patients were treated by radiotherapy: 39Gy-84Gy to primary tumors (median, 68Gy) and 36Gy-74Gy to cervical lymph nodes (median, 60Gy); 84.3% of the patients were treated by chemotherapy either. The complete response rate was 94.1%. The 5-, 10-, and 15-year survival rates were 78%±4%, 70%±5%, and 66%±6%, respectively. Tumor node metastasis (TNM) stage was the statistically significant predictor of distal metastasis and OS. Distal metastasis was the major pattern of treatment failure. The main long-term complications of therapy were xerostomia (47.0%), hearing loss (28.1%), neck fibrosis (24.3%), trismus (12.4%), glossolalia (7.0%), and radiation encephalopathy (5.4%). The incidences of these morbidities were significantly higher in the high radiation dose (more than the median) group than in the low radiation dose group (less than or equal to the median), while no differences in survival were observed. CONCLUSIONS: In spite of the majority of patients diagnosed at the advanced stage, children and adolescents with NPC had excellent survival except metastatic disease. The TNM stage was the most relevant prognostic factor. A higher radiation dose (>68Gy) could not improve survival but could increase long-term morbidities. Copyright © 2013 Elsevier Ireland Ltd. All rights reserved.
Cerebral hyperperfusion syndrome: a novel presentation of internal carotid artery dissection.
Neurology. 2013 Jul 3. [Epub ahead of print]


From the Neurology (J.P., S.R., S.V., C.F.) and Neuroradiology (M.R., J.R.) Departments, Hospital de Braga, Portugal.

Cervical artery dissection (CeAD) occurs preferentially in the middle-aged, and its annual incidence rate is 2.6 to 3.0 per 100,000.(1) Manifestations of internal carotid artery dissection (ICAD) include ischemic stroke and TIA (>70% of patients), headache, neck pain, Horner syndrome, cranial nerve palsy, pulsatile tinnitus, and, rarely, subarachnoid hemorrhage.(2) Cerebral hyperperfusion syndrome is known to occur after carotid artery revascularization procedures and it is thought to result from the combination of several factors that impair cerebral vascular autoregulatory mechanisms.(3).

Autoimmune Inner Ear Disease: A Retrospective Review of Forty-Seven Patients.

Matsuoka AJ, Harris JP.

Department of Otolaryngology - Head and Neck Surgery, Northwestern University, Chicago, Ill., USA.

The purpose of this retrospective study was to characterize and further define autoimmune inner ear disease (AIED) using the Harris AIED classification. A retrospective review was conducted at two tertiary medical centers for 47 patients who were diagnosed with AIED. The overall patient response rate to oral prednisone treatment was 69.7%. The sensitivity of the test for a serum antibody against heat-shock protein 70 (HSP70) was 54.5% and the specificity was 42.9%. Therefore, the clinical utility of the HSP70 antibody test appeared to be limited with respect to the diagnosis of AIED. Vertigo, tinnitus and aural fullness improved significantly with both of the newly developed adalimumab (Humira®) and rituximab (Rituxan®). However, hearing loss did not improve in the present study. Copyright © 2013 S. Karger AG, Basel.

Pulsatile tinnitus: imaging and differential diagnosis.

Hofmann E, Behr R, Neumann-Haefelin T, Schwager K.

Klinikum Fulda gAG, Departments of, Neuroradiology.

BACKGROUND: Pulsatile tinnitus, unlike idiopathic tinnitus, usually has a specific, identifiable cause. Nonetheless, uncertainty often arises in clinical practice about the findings to be sought and the strategy for work-up. METHODS: Selective literature review and evaluation of our own series of patients. RESULTS: Pulsatile tinnitus can have many causes. No prospective studies on this subject are available to date. Pulsatile tinnitus requires both a functional organ of hearing and a genuine, physical source of sound, which can, under certain conditions, even be objectified by an examiner. Pulsatile tinnitus can be classified by its site of generation as arterial, arteriovenous, or venous. Typical arterial causes are arteriosclerosis, dissection, and fibromuscular dysplasia. Common causes at the arteriovenous junction include arteriovenous fistulae and highly vascularized skull base tumors. Common venous causes are intracranial hypertension and, as predisposing factors, anomalies and normal variants of the basal veins and sinuses. In our own series of patients, pulsatile tinnitus was most often due to highly vascularized tumors of the temporal bone (16%), followed by venous normal variants and anomalies (14%) and vascular stenoses (9%). Dural arteriovenous fistulae, inflammatory hyperemia, and intracranial hypertension were tied for fourth place (8% each). CONCLUSION: The clinical findings and imaging studies must always be evaluated together. Thorough history-taking and clinical examination are the basis for the efficient use of imaging studies to reveal the cause of pulsatile tinnitus. Free PMC Article.
Clinical characteristics and therapeutic response of objective tinnitus due to middle ear myoclonus: A large case series.

Park SN, Bae SC, Lee GH, Song JN, Park KH, Jeon EJ, Park YS, Yeo SW.

Department of Otolaryngology-Head and Neck Surgery, The Catholic University of Korea, College of Medicine, Seoul, South Korea.

OBJECTIVES/HYPOTHESIS: To evaluate the clinical characteristics and therapeutic response of tinnitus due to middle ear myoclonus (MEM) and to suggest appropriate diagnostic methods. STUDY DESIGN: Retrospective chart review. METHODS: This study included 58 patients with tinnitus diagnosed with MEM, who were seen from January 2004 to July 2011. Clinical and audiological characteristics were investigated. The therapeutic responses to counseling, medical therapy, and surgical therapy were evaluated. RESULTS: Patients had a mean age of 29.8 years (range, 6-70 years), 20.7% (n = 12) were <10 years old, 39.7% (n = 23) were <20 years old, 74.1% (n = 43) were <40 years old, and 5.2% (n = 3) were ≥60 years old. Remembered stressful events or noise exposure were associated with the onset of MEM in 51.8% (n = 30) and 27.6% (n = 16) of patients, respectively. The most frequent nature of the tinnitus was a crackling sound. MEM associated with forceful eyelid closure was observed in 15% of patients. Impedance audiogram and otoendoscopic examinations of the tympanic membrane were helpful tools for diagnosing MEM. With medical therapy, more than 75% of patients exhibited complete or partial remission of their tinnitus. Patients with intractable MEM who underwent sectioning of the middle ear tendons had very good outcomes. CONCLUSIONS: Tinnitus due to middle ear myoclonus seems to occur in young patients and to be related to stress or noise. Information about the clinical characteristics and therapeutic response of this less-common type of tinnitus will help to ensure early and appropriate diagnosis and treatment of these patients. Copyright © 2013 The American Laryngological, Rhinological, and Otological Society, Inc.

Sensorineural hearing loss: a complication of acute otitis media in adults.
Eur Arch Otorhinolaryngol. 2013 Aug 30. [Epub ahead of print]

Park JH, Park SJ, Kim YH, Park MH.

Department of Otorhinolaryngology-Head and Neck Surgery, Seoul Metropolitan Government-Seoul National University Boramae Medical Center, 425 Shindaebang-dong, Dongjak-gu, Seoul, 156-707, South Korea.

We aim to evaluate the incidence and clinical manifestations of sensorineural hearing loss (SNHL) in adult patients with acute otitis media (AOM). Seventy-five patients (age > 18 years; 83 ears) diagnosed with AOM between January 2008 and March 2011 at our clinic were enrolled and retrospectively reviewed. We detected audiometrically confirmed SNHL during the course of AOM in eight patients. The clinical course, treatment, and audiometric final outcome of each case were reviewed. SNHL was associated with AOM in 8 out of 83 ears (9.3%). The mean age of patients was 57.5 years, and the mean follow-up period was 21.1 months (range 0.6-46.3 months). The most common symptom was tinnitus. Mean bone conduction hearing threshold was 39.5 dB in pure tone audiometry. All patients showed high-frequency HL, and three showed pan-frequency HL. All patients were treated with oral antibiotics at the initial visit. Seven ears were treated with a combination of oral steroids. Myringotomy was also performed. Seven of eight patients showed improvement; however, 8 kHz thresholds were not improved. This suggested that the inflammation spread through the round window. The mean duration of recovery was 18.6 days. SNHL associated with AOM in adult patients occurs during the early phases of the disease course. High-frequency hearing was commonly affected and was well treated with oral antibiotics, myringotomy, and steroid therapy. Audiometry can be helpful for treating adult patients with AOM. Active treatment, including myringotomy, should be performed during the early phase, if SNHL is suspected.
Clinical characteristics of pulsatile tinnitus caused by sigmoid sinus diverticulum and wall dehiscence: a study of 54 patients.
Acta Otolaryngol. 2013 Sep 16. [Epub ahead of print]

Department of Otolaryngology Head and Neck Surgery.

Abstract Conclusions: CT angiography (CTA) and digital subtraction angiography (DSA) are valuable tools in imaging work-ups for the diagnosis of sigmoid sinus diverticulum (SSD) and sigmoid sinus wall dehiscence (SSWD). The development of pulsatile tinnitus (PT) resulting from SSD and SSWD may be associated with the dominance of venous systems. Objective: Our goal was to evaluate the clinical characteristics of PT caused by SSD and SSWD. Methods: This was a retrospective chart review undertaken in a tertiary academic referral center. Fifty-four patients with PT due to SSD and SSWD were recruited. Hospital files of these patients were assessed. Data included medical history, physical examinations, auxiliary examinations, and radiographic findings of CTA and DSA. Results: The study population comprised 51 females and 3 males. Most patients with PT caused by SSD and SSWD were middle-aged women. All had normal otoscopy results. Anomalies occurred in or adjacent to the region of the transverse-sigmoid sinus junction in 52 patients. Half of the patients (27/54) presented abnormal results of examination of blood lipids. There were 57.41% (31/54) cases with ipsilateral dominance of the venous system, 9.26% (5/54) cases with contralateral dominance, and 33.33% (18/54) cases with co-dominance of the venous system.

Blast-related ear injuries among U.S. military personnel.

Dougherty AL, Macgregor AJ, Han PP, Viirre E, Heltemes KJ, Galarneau MR.

Blast-related ear injuries are a concern during deployment because they can compromise a servicemember's situational awareness and adversely affect operational readiness. The objectives of this study were to describe blast-related ear injuries during Operation Iraqi Freedom, identify the effect of hearing protection worn at the point of injury, and explore hearing loss and tinnitus outcomes within one year after injury. The Expeditionary Medical Encounter Database was used to identify military personnel who survived blast-related injury, and it was linked with outpatient medical databases to obtain diagnoses of hearing loss and tinnitus. The prevalence of ear injuries was 30.7% (1,223 of 3,981). The most common ear injury diagnoses were "inner or middle ear injury involving tinnitus" and tympanic membrane (TM) rupture. Hearing protection reduced the odds of ear injury involving tinnitus. Personnel with TM rupture had higher odds of hearing loss (odds ratio [OR] = 6.65, 95% confidence interval [CI] = 5.04-8.78) and tinnitus outcomes (OR = 4.34, 95% CI = 3.12-6.04) than those without TM rupture. Ear injuries and hearing impairment are frequent consequences of blast exposure during combat deployment. Hearing protection is warranted for all servicemembers at risk of blast exposure. Free full text.
INTRODUCTION: Spontaneous intracranial hypotension (SIH) is classically characterised by orthostatic headache resulting from loss of cerebrospinal fluid (CSF) volume, where lumbar puncture or spinal/cranial surgery is not the cause of CSF leakage. The estimated incidence of SIH is 5/100,000/year, half that of subarachnoid haemorrhage, yet the disorder remains under-recognised. Almost all patients are misdiagnosed at first, sometimes for many years, and severely disabling symptoms are common. The International Classification of Headache Disorders (2004) diagnostic criteria for SIH include investigation results and treatment response, and their fallibility has been highlighted in a call for revised criteria. However, neither have a strong focus on the nature and chronology of symptoms that might assist the clinician to first suspect this disabling condition. METHODS: In order to better understand the ‘story’ of a patient with SIH we retrospectively reviewed case notes of 8 cases seen at our institution between 2010-2012. RESULTS: 5/8 patients were female, median age 33.5 years (range 20-53). 7/8 patients were initially misdiagnosed, with a median delay to diagnosis of 4 months (range 0.13-24). 5/8 patients had a thunderclap onset, 2/8 sub-acute (hours), and 1/8 gradual (days). 7/8 patients suffered a pattern of new onset daily headache from onset, with one having initially episodic (cough-induced) headaches developing in to chronic daily headache. A clear precipitating activity such as squatting, coughing and weightlifting, was only apparent in 3/8 patients. All patients described initial onset of pain in the cranio-cervical region. In 3/8 this radiated to the orbito-frontal region and in (an independent) 3/8 the top of the head. Despite the diagnostic hallmark of SIH being regarded as orthostatic headache, 3/8 patients reported no positional worsening of their symptoms. Two of these 3 patients had had symptoms for one year, but the third only for 4 days. Bizarre sounding additional symptoms were common, leading to diagnoses of anxiety or a psychogenic nature in some. These included cranial and limb sensory symptoms, sensations like trickling water (head and back), tinnitus, "gnawing" and "crushing" facial pain, neck stiffness and visual symptoms. Two patients collapsed at onset, one with syncope. 4/8 patients had entirely normal neuroimaging (8/8 CT, 6/8 CT and contrast-enhanced MR brain +/-MR cervical spine). Response to treatment (blind epidural blood patch) was rapid and dramatic in 6/8, but required a 2nd procedure in 3 patients. Relapse occurred in one patient. CONCLUSIONS: SIH is an under-recognised but fairly common disorder. Clinical examination is usually normal, and confirmation of the diagnosis requires investigations and treatment not used routinely in the management of headache. Investigations, including contrast-enhanced neuroimaging, are often normal in the acute or chronic phase. Clinical history taking skills are therefore paramount in recognising this disorder. Characteristic features include a new daily persistent headache in a cranio-cervical distribution, with often bizarre sounding additional symptoms. Our results challenge the prevailing notions that thunderclap onset is rare and orthostatic headache is a mandatory criterion for this diagnosis.

[The epidural blood patch technique for the management of headache due to spontaneous intracranial hypotension.]
[Article in Turkish]
Güldoğuş F, Kelsaka E.
Department of Algology, Ondokuz Mayis University Faculty of Medicine, Samsun, Turkey.

Spontaneous intracranial hypotension is a clinical entity characterized by orthostatic headache, low CSF pressure and specific cranial imaging techniques. Headache can be accompanied by the symptoms such as tinnitus, vertigo, diplopia, nausea and vomiting. It is important for the diagnosis to show the level of CSF leakage. Epidural blood patch should be planned for the treatment of patients with no reduction of the complaints following conservative treatment. In this case report, we have discussed the diagnostic methods of spontaneous intracranial hypotension and the importance of an epidural blood patch for its treatment in the light of the literature. Free full text.
XVI Animal Models

Effects of Salicylate on the Inflammatory Genes Expression and Synaptic Ultrastructure in the Cochlear Nucleus of Rats.

Inflammation. 2013 Oct 4. [Epub ahead of print]

Hu SS, Mei L, Chen JY, Huang ZW, Wu H.

Department of Otolaryngology-Head and Neck Surgery, Xinhua Hospital, Shanghai Jiao Tong University School of Medicine, 1665 Kongjiang Road, Shanghai, 200092, China.

Aspirin (salicylate), as a common drug that is frequently used for long-term treatment in a clinical setting, has the potential to cause reversible tinnitus. However, few reports have examined the inflammatory cytokines expression and alteration of synaptic ultrastructure in the cochlear nucleus (CN) in a rat model of tinnitus. The tinnitus-like behavior of rats were detected by the gap prepulse inhibition of acoustic startle (GPIAS) paradigm. We investigated the expression levels of the tumor necrosis factor-α (TNF-α), interleukin-6 (IL-6), N-methyl D-aspartate receptor subunit 2A (NR2A) mRNA and protein in the CN and compared synapses ultrastructure in the CN of tinnitus rats with normal ones. GPIAS showed that rats with long-term administration of salicylate were experiencing tinnitus, and the mRNA and protein expression levels of TNF-α and NR2A were up-regulated in chronic treatment groups, and they returned to baseline 14 days after cessation of treatment. Furthermore, compared to normal rats, repetitive salicylate-treated rats showed a greater number of presynaptic vesicles, thicker and longer postsynaptic densities, increased synaptic interface curvature. These data revealed that chronic salicylate administration markedly, but reversibly, induces tinnitus possibly via augmentation of the expression of TNF-α and NR2A and cause changes in synaptic ultrastructure in the CN. Long-term administration of salicylate causes neural plasticity changes at the CN level.

A Novel Behavioral Assay for the Assessment of Acute Tinnitus in Rats Optimized for Simultaneous Recording of Oscillatory Neural Activity.


Stolzberg D, Hayes SH, Kashanian N, Radziwon K, Salvi RJ, Allman BL.

Center for Hearing & Deafness, Department of Communicative Disorders and Sciences, University at Buffalo, the State University of New York, Buffalo, New York 14215, United States of America; Department of Physiology and Pharmacology, Schulich School of Medicine and Dentistry, University of Western Ontario, Ontario N6A 5C1, Canada. Electronic address: dstolzbe@uwo.ca.

BACKGROUND: Human magneto/electrophysiology studies suggest that the phantom sound of tinnitus arises from spontaneous oscillatory neural activity in auditory cortex; however, in animal models, behavioral techniques suitable for testing this hypothesis in combination with electrophysiology recordings have yet to be evaluated. While electrophysiological studies of tinnitus have been reported in passive, awake animals, these studies fail to control for attentional mechanisms likely to play a role in the perception of tinnitus. New METHOD: A novel appetitive operant conditioning, two-alternative identification task was developed for detecting acute tinnitus in rats. The procedure optimizes conditions for simultaneously recording oscillatory neural activity while controlling for the attentional state of the animal. RESULTS: Tinnitus was detected in six of seven rats following systemic injection with sodium salicylate (200mg/kg IP), a known inducer of tinnitus. Analysis of ongoing local field potentials recorded from chronically implanted electrodes in auditory cortex of a rat reporting tinnitus revealed changes in the spectrum of ongoing neural activity. Comparison with Existing Method(s): Existing tinnitus-detection methods were not explicitly designed for the simultaneous recording of neural activity. The behavioral method reported here is the first to provide the conditions necessary for obtaining these recordings in chronically implanted rats. CONCLUSIONS: The behavioral assay presented here will facilitate research into the neural mechanisms of tinnitus by allowing researchers to compare the electrophysiological data in animals with confirmed tinnitus. Copyright © 2013 Elsevier B.V. All rights reserved.
Clinical Presentation and Imaging Findings in Patients With Pulsatile Tinnitus and Sigmoid Sinus Diverticulum/Dehiscence.
Otol Neurotol. 2013 Sep 4. [Epub ahead of print]


* Department of Otolaryngology, Georgetown University Hospital; † Department of Radiology, Howard University Hospital; and ‡ Department of Radiology, Georgetown University Hospital, Washington, District of Columbia, U.S.A.

OBJECTIVE: Sigmoid sinus diverticulum/dehiscence (SSDD) is an increasingly recognized venous cause for pulsatile tinnitus (PT). SSDD is amenable to surgical/endovascular intervention. We aim to understand the clinical and imaging features of patients with PT due to SSDD. STUDY DESIGN: Retrospective CT study and chart review. SETTING: Tertiary-care, academic center. PATIENTS: Cohort 1: 200 consecutive unique temporal bone CT were blindly reviewed for anatomic findings associated with PT. Cohort 2: 61 patients with PT were evaluated for otologic manifestations. INTERVENTION(S): All patients underwent a temporal bone CT for evaluation of PT. Clinical information was gathered using electronic medical records.

MAIN OUTCOME MEASURE(S): Otologic symptoms and physical findings (including body mass index (BMI), mastoid/neck bruits) were analyzed. Temporal bone CT scans were evaluated for the presence of SSDD and other possible causes of PT. RESULTS: Cohort 1: 35 cases of SSDD were identified (18%); 10 (29%) true diverticula; and 25 (71%) dehiscence. Sixty-six percent were right sided. Twelve patients had PT (34%). Patients with SSDD are more likely to have PT (p = 0.003). A significant association between right SSDD and PT was found (p = 0.001). Cohort 2: 15 out of 61 patients had PT and CT-confirmed SSDD. All were female subjects; average age was 45 years (26-73 yr). Radiologic evaluation revealed 10 SSDD cases on the right (66.7%), 2 on the left (13.3%), and 3 bilateral (20%). Sensorineural hearing loss was seen in 8 (53%), aural fullness in 12 (80%). Average BMI was 32.2 (21.0-59.82), and 4 (26%) had audible mastoid bruits. CONCLUSION: SSDD may be the most common identifiable cause for PT from venous origin and is potentially treatable. Temporal bone CT scans should be included in a complete evaluation of PT.

Noise-Induced Tinnitus Using Individualized Gap Detection Analysis and Its Relationship with Hyperacusis, Anxiety, and Spatial Cognition.
PloS ONE, Volume 8, Issue 9, 12 September 2013, Article number e75011.

Pace, E.a, Zhang, J.ab

a Department of Otolaryngology-Head and Neck Surgery, Wayne State University School of Medicine, Detroit, MI, United States; b Department of Communication Sciences and Disorders, Wayne State University College of Liberal Arts and Sciences, Detroit, MI, United States.

Tinnitus has a complex etiology that involves auditory and non-auditory factors and may be accompanied by hyperacusis, anxiety and cognitive changes. Thus far, investigations of the interrelationship between tinnitus and auditory and non-auditory impairment have yielded conflicting results. To further address this issue, we noise exposed rats and assessed them for tinnitus using a gap detection behavioral paradigm combined with statistically-driven analysis to diagnose tinnitus in individual rats. We also tested rats for hearing detection, responsivity, and loss using prepulse inhibition and auditory brainstem response, and for spatial cognition and anxiety using Morris water maze and elevated plus maze. We found that our tinnitus diagnosis method reliably separated noise-exposed rats into tinnitus(+) and tinnitus(-) groups and detected no evidence of tinnitus in tinnitus(-) and control rats. In addition, the tinnitus(+) group demonstrated enhanced startle amplitude, indicating hyperacusis-like behavior. Despite these results, neither tinnitus, hyperacusis nor hearing loss yielded any significant effects on spatial learning and memory or anxiety, though a majority of rats with the highest anxiety levels had tinnitus. These findings showed that we were able to develop a clinically relevant tinnitus(+) group and that our diagnosis method is sound. At the same time, like clinical studies, we found that tinnitus does not always result in cognitive-emotional dysfunction, although tinnitus may predispose subjects to certain impairment like anxiety. Other behavioral assessments may be needed to further define the relationship between tinnitus and anxiety, cognitive deficits, and other impairments. © 2013 Pace, Zhang. Free PMC Article.
Clinical Trials
Source: www.clinicaltrials.gov (November 2013)

Phase 1 Study to Study the Efficacy and Safety of Cannabis in the Treatment of Tinnitus

This study is not yet open for participant recruitment.
Study NCT01969474
Information provided by (Responsible Party): Oron Yahav, Wolfson Medical Center.
Study Start Date: December 2013
First Received on October 14, 2013

The hypothesis of the study is that the use of Cannabis will attenuate the tinnitus level as experienced by the patients.

A Blinded Randomized Pilot Study Assessing Vagus Nerve Stimulation (VNS) Paired With Tones for Tinnitus vs. VNS With Unpaired Tones

This study is not yet open for participant recruitment.
Study NCT01962558
Information provided by (Responsible Party): MicroTransponder Inc.
Study Start Date: November 2013
First Received on October 09, 2013

Patients who have moderate to severe tinnitus, at least one year post diagnosis, may enroll. All patients will be implanted and randomized to one of two groups:

- a group receiving VNS paired with tones (half second tones that occur during brief ½ second bursts of VNS) for 2.5 hours daily (believed effective group) and;
- a group that receives VNS and tones in an unpaired manner for 2.5 hours daily (10 minutes of tones only, 5 minutes of no tones and no VNS, 2 hours of VNS only, 5 minutes of no VNS and no tones, and 10 minutes of tones only).

After device use training, therapy is delivered at home by the patient for 6 weeks. Patients have eight baseline audiometric assessments along with two questionnaire assessments, an assessment after recovery before treatment starts, and tinnitus assessments every two weeks during therapy through the 6 week randomized portion of the study. After the randomized portion, all patients receive VNS paired with tones. Patients will continue to return for quarterly visits and tinnitus assessments through the first year after implant, regardless of their therapy status. Interested patients can continue to receive longer-term treatment after the first year. A goal of up to 30 patients enrolled and implanted across four sites is planned for this study.
Effectiveness of Daily Bi-temporal Transcranial Random Noise Stimulation in Patients With Chronic Tinnitus (tRNS-tin)

This study is currently recruiting participants.
Study NCT01965028
Information provided by (Responsible Party): Berthold Langguth, MD, Ph.D., University of Regensburg
Study Start Date: October 2013
First Received on October 14, 2013

Tinnitus is the phantom auditory perception of sound in the absence of an external or internal acoustic stimulus. It is a frequent problem which can interfere significantly with the ability to lead a normal life. Tinnitus has been shown to be generated in the brain, as a result of functional reorganization of auditory neural pathways and the central auditory system. These changes are represented by hyper-activity and hypersynchronicity in the auditory pathway. Treatment remains difficult. Non-invasive brain stimulation methods has shown to be effective in the treatment of chronic tinnitus with moderate effect size. Preliminary data presented on international conferences suggest the use of transcranial random noise stimulation (tRNS) over both auditory cortices as new and highly effective treatment. High-frequency (hf; 100-650Hz) tRNS might be highly effective in tackling hyper-synchronised cell assemblies. Daily Hf-tRNS (2 weeks) will be examined with regard to feasibility, safety and clinical efficacy in patients suffering from chronic tinnitus in an one-arm pilot trial.

Treatment of Tinnitus With Transcranial Magnetic Stimulation (Tinnitus rTMS 2013)

This study is not yet open for participant recruitment.
Study NCT01929837
Information provided by (Responsible Party): Turku University Hospital
Study Start Date: September 2013
First Received on June 24, 2013.

Tinnitus is the perception of sound in the absence of corresponding external sound. Tinnitus affects approximately 10-15 % of the population. The prevalence increases with age and it is estimated that more than 20 % of the older people have tinnitus. Approximately 10-15 % of tinnitus patients have clinically relevant, disabling tinnitus causing for example anxiety, depression and sleep disturbances. The treatment of chronic tinnitus is difficult and most therapies focus on alleviating the condition rather than treating the cause. Pathophysiology of tinnitus still remains incompletely understood. Functional brain imaging data in tinnitus patients and animal models suggest that tinnitus is associated with increased neuronal activity, increased synchronicity, and functional reorganization within the auditory cortex either uni- or bilaterally, but there are also functional alterations in brain areas outside the auditory system. Transcranial magnetic stimulation (TMS) is a neuromodulation technique based on the principle of electromagnetic induction of an electric field in the brain by means of magnetic pulses given to the scalp. TMS is a non-invasive, painless, and safe method for modulation of cortical activity. TMS pulses given at low frequencies (≤ 1 Hz) have been shown to decrease cortical excitability both in experimental settings and humans, which forms the basis for using low frequency rTMS to treat chronic tinnitus patients, in whom hyperactivity of the auditory cortex has been observed in functional brain imaging studies.
Investigating The Neurobiology of Tinnitus

This study is not yet open for participant recruitment.
ClinicalTrials.gov Identifier: NCT01294124
Information provided by (Responsible Party): Jay F. Piccirillo, MD, Washington University School of Medicine
Study Start Date: September 2013
First received: February 9, 2011

The investigators hypothesize that individual differences exist in resting-state cortical attention, control, sensory, and emotion networks prior to noise exposure and these differences predispose some to the development of bothersome tinnitus. Furthermore, the investigators hypothesize that these changes in functional connectivity of these vulnerable systems after noise exposure are responsible for tinnitus. The proposed study will use a case-control cohort study design. Cases will be those soldiers who develop tinnitus and controls will be those who do not. This will be the first prospective study of tinnitus and will provide important information about the neurobiology of tinnitus.

If a cortical neural network etiology for bothersome tinnitus is confirmed, it will be an astounding, powerful, paradigm shifting model for the diagnosis, prevention and, most importantly, treatment of tinnitus. Furthermore, if a battery of neurocognitive tests can identify soldiers at risk for the development of tinnitus then appropriate primary prevention strategies can be introduced.

There are three Specific Aims to this project.

Specific Aim 1. To determine if soldiers who develop tinnitus display pre-deployment differences in a set of physical, functional, cognitive, vulnerability, perpetuating factors, pre-deployment neurocognitive scores, or neuroimaging features compared to soldiers who do not develop tinnitus (“control group”).

Specific Aim 2. To determine if particular scores on neurocognitive tests or neuroimaging features of functional/structural connectivity networks are associated with the development of tinnitus.

Specific Aim 3. To identify a set of pre-deployment physical, functional, cognitive, vulnerability, and perpetuating factors, neurocognitive responses, and neuroimaging features that are associated with the development of tinnitus.

The investigators plan to recruit 200 soldiers, between the ages of 18 and 30 years who do not have hearing loss or tinnitus and have never been deployed to military theater. The soldier participants will undergo a variety of tests before and after deployment, which will include a hearing test, neurocognitive tests (i.e., brain function tests), and a variety of novel radiologic imaging studies of the brain. One of these novel radiologic imaging studies is functional connectivity Magnetic Resonance Imaging, a proven methodology that monitors changes in brain activity and connections based on blood flow between different brain areas and levels of consumption of oxygen. This information is used to describe the condition of important neural networks responsible for such things as attention, mood, sensation, vision, hearing, and introspection or self-contemplation.
**Neuromodulation Techniques in the Treatment of Chronic Tinnitus With Hearing Loss**

This study has been completed.
ClinicalTrials.gov Identifier: NCT01944501
Information provided by (Responsible Party): Joaquim Brasil-Neto, University of Brasilia
Study Start Date: March 2012
First received: September 9, 2013

Tinnitus is a very common condition and affects approximately 15% of the population, disrupting sleep, emotional balance and social life of the patients. Acoustic deprivation causes hearing loss and is responsible for a cascade of processes that result in the reorganization of the cortex through a synchronization of neuronal activity related to a cortical re-mapping. Consistent with the hypothesis that tinnitus is caused by abnormal activation of the auditory cortex, repetitive transcranial magnetic stimulation (rTMS) can temporarily reduce cortical hyperactivity through direct neuromodulation of the temporal cortex. Furthermore, studies have shown that transcranial direct current stimulation (tDCS) can also suppress tinnitus. Objective: To determine the effectiveness of rTMS and tDCS in the treatment of patients with chronic tinnitus and auditory loss. Methods: We performed an analytical experimental double-blind study using rTMS and tDCS in patients with chronic tinnitus and hearing loss.

**Treatment of Acute Peripheral Tinnitus Following Traumatic Cochlear Injury or Otitis Media**

This study is not yet open for participant recruitment.
ClinicalTrials.gov Identifier: NCT01803646
Information provided by (Responsible Party): Auris Medical, Inc.
Study Start Date: December 2013
First received: March 1, 2013

The present study is assessing the drug's safety and is aiming to demonstrate efficacy of repeated i.t. AM101 injections in the treatment of acute peripheral tinnitus.

**Effect of Time Shift of Transcranial Direct Current Stimulation (tDCS) for Treatment of Acute Tinnitus**

This study is currently recruiting participants.
ClinicalTrials.gov Identifier: NCT01886729
Information provided by (Responsible Party): Ethisch Comité UZ Antwerpen, University Hospital, Antwerp
Study Start Date: April 2012
First received: June 21, 2013

The treatment for patients with acute tinnitus consists of Methylprednisolone and hyperbaric oxygen therapy. For this study transcranial direct current stimulation (tDCS) was added to the protocol. The purpose is to determine the effect of the time shift of tDCS. Two conditions will be compared: tDCS simultaneously with the hyperbaric oxygen therapy or tDCS 3 weeks after the start of the tinnitus. An audiological testing will be performed at the day of admission, after 3 weeks, 6 weeks and 12 weeks.
Effectiveness of Repetitive Transcranial Magnetic Stimulation (rTMS) in Combination With Relaxation Therapy in Patients With Chronic Tinnitus

This study is currently recruiting participants.
ClinicalTrials.gov Identifier: NCT01907022
Information provided by (Responsible Party): Berthold Langguth, MD, Ph.D., University of Regensburg
Study Start Date: July 2013
First received: July 19, 2013

Tinnitus is the phantom auditory perception of sound in the absence of an external or internal acoustic stimulus. It is a frequent problem which can interfere significantly with the ability to lead a normal life. One significant modulator of tinnitus is stress. Tinnitus has been shown to be generated in the brain, as a result of functional reorganization of auditory neural pathways and the central auditory system. Also non-auditory cortical areas of attention allocation and emotional processing was shown to be involved. Treatment remains difficult. The most effective treatment in chronic tinnitus is cognitive behavioral therapy including elements of relaxation therapy. Repetitive transcranial magnetic stimulation (rTMS) is also effective in treatment of tinnitus with moderate effect size. Pilot data were positive for low-frequency rTMS applied to the temporoparietal areas and high-frequency rTMS applied to the left frontal cortex. Newer findings indicate that exercise-combined non-invasive brain stimulation might show superior effects in contrast to rTMS or exercise alone. Combination of relaxation and two-sided (frontal and temporo-parietal) rTMS will be examined with regard to feasibility, safety and clinical efficacy in patients suffering from chronic tinnitus in a pilot trial.

AM-101 in the Post-Acute Treatment of Peripheral Tinnitus 1 (AMPACT1) - an Open-Label Extension to the TACTT2 Study

This study is not yet open for participant recruitment.
ClinicalTrials.gov Identifier: NCT01934010
Information provided by (Responsible Party): Auris Medical, Inc.
Study Start Date: February 2014
First received: August 15, 2013

The purpose of this study is the evaluation of the safety and local tolerance of repeated treatment cycles of AM-101 in subjects previously treated in the scope of the TACTT2 study (NCT01803646).


This study is not yet open for participant recruitment.
ClinicalTrials.gov Identifier: NCT01451853
Information provided by (Responsible Party): Sound Pharmaceuticals, Incorporated.
Study Start Date: March 2014
First received: October 7, 2011

Chemotherapy treatment with the platinum containing chemotherapies (e.g. cisplatin, carboplatin) are well noted and studied for their ability to cause ototoxicity which includes hearing loss, tinnitus, vertigo, or dizziness. It is the objective of this study to determine the safety and efficacy of SPI-1005 at three dose levels when delivered orally twice daily for 3 days, surrounding each cycle of platinum chemotherapy for head and neck or non-small cell lung cancer patients to prevent and treat chemotherapy induced hearing loss and tinnitus.

SPI-1005, a proprietary oral formulation of ebselen is a small molecule mimic and inducer of the enzyme Glutathione Peroxidase. GPx reduces reactive oxygen species (ROS) by reacting with glutathione. SPI-1005 has been shown to reduce cisplatin induced hearing threshold shift in animal studies.
Phase 3 Clinical Trial: D-Methionine to Reduce Noise-Induced Hearing Loss (NIHL)

This study is not yet open for participant recruitment.
ClinicalTrials.gov Identifier: NCT01345474
Information provided by (Responsible Party): Kathleen CM Campbell, PhD, Southern Illinois University
Study Start Date: September 2013
First received: April 27, 2011

Hearing loss can render a soldier less able to detect and identify the enemy, less able to understand commands, particularly in background noise typical on the battlefield, and may permanently reduce quality of life. In some cases, hearing loss may preclude redeployment or result in less optimal job assignment. Currently, no FDA approved pharmacological prevention exists for noise-induced hearing loss (NIHL). We have documented in animal studies that administration of D-methionine (D-met) can reduce or prevent NIHL. We now need to determine if it has similar efficacy in humans. Although we have not yet tested D-Met on protection from noise-induced tinnitus in animals, this clinical trial would provide us the opportunity to also test for protection from noise induced tinnitus simultaneously.

Objective Hypotheses:

Primary Hypothesis: Administration of oral D-methionine prior to, during and 4 days post-weapons training will reduce or prevent permanent noise-induced hearing loss.

Secondary Hypothesis: Administration of oral D-methionine prior to, during and 4 days post-weapons training will reduce or prevent noise-induced tinnitus.

Specific Aims:

1. To determine whether administering oral D-met can prevent permanent NIHL after weapons training. This aim will be addressed by comparing the results of D-met versus placebo administration starting 3 days prior to, during the 11 day period of weapons training (Monday-Friday for first week, Monday-Thursday for second week), and 4 days after for a total of 18 days. Pure tone hearing thresholds will be assessed before and 22 days after completion of weapons training (ie; 18 days after the last day of study drug/placebo administration).

2. To determine whether administering oral D-met can prevent tinnitus after weapons training. This aim will be addressed by comparing the results of D-met versus placebo administration starting 3 days prior to, during the 11 day period of weapons training (Monday-Friday for first week, Monday-Thursday for second week), and 4 days after for a total of 18 days. Tinnitus questionnaires will be assessed before and 22 days after completion of weapons training (ie; 18 days after the last day of study drug/placebo administration).

3. To monitor for any potential side effects of D-met in human subjects. This aim will be accomplished by subject query on each day study drug is dispensed (twice daily) and at final study visit, routing of any adverse event reports to study medical personnel, statisticians and to the Food and Drug Administration (FDA).
A Randomized, Double-Blind, Dose Comparison Phase 2 Pilot Study of Manualized 3,4-methylenedioxyamphetamine (MDMA)-Assisted Psychotherapy in 12 Subjects With Treatment-Resistant Posttraumatic Stress Disorder (PTSD) - Canada

This study is currently recruiting participants.
ClinicalTrials.gov Identifier: NCT01958593
Information provided by (Responsible Party): Multidisciplinary Association for Psychedelic Studies
Study Start Date: September 2013
First received: October 7, 2013

Posttraumatic stress disorder (PTSD) is a debilitating disorder that can develop after people experience a traumatic event, such as a rape, car accident or other life threatening event. PTSD is a worldwide health problem. PTSD is treated with psychotherapy or drugs, but these treatments do not help everyone. 3,4-methylenedioxyamphetamine (MDMA)-assisted psychotherapy might be a potential treatment for PTSD. MDMA is the active ingredient in ecstasy. Before it was made illegal, some psychotherapists combined MDMA with psychotherapy to help treat people with psychological problems, including PTSD.

This is a Phase 2 randomized, dose comparison, double-blind study to assess safety and efficacy of manualized MDMA-assisted psychotherapy in treating chronic, treatment-resistant PTSD. Seven subjects will be randomized to receive full dose MDMA (full dose condition) and five subjects will receive a comparator dose (comparator condition), with an optional supplemental half-dose available 1.5 to 2.5 hours after the initial dose. Global Clinician-Administered PTSD Scale (CAPS) score one month after two sessions of MDMA-assisted psychotherapy is the primary outcome measure.

MDMA will be administered in two blinded experimental sessions lasting up to eight hours and scheduled three to five weeks apart.

The will last up to one and a half years, including approximately three to five months of psychotherapy, and a long-term follow up visit scheduled a year after the final experimental session. Study subjects will have a medical and psychiatric examination to assess eligibility for enrollment. Once in the study, they will see the same male and female psychotherapist for the entire study. The subject will learn more about MDMA-assisted psychotherapy and the investigators will learn more about the subject during three preparatory sessions occurring before the first experimental session. During experimental sessions, subjects will receive an initial dose of either full or comparator dose MDMA along with psychotherapy, and one and a half to two and a half hours later, the subject may have a supplemental half the size of the initial dose. Vital signs and psychological distress will be measured throughout the experimental session. There will be three integrative psychotherapy sessions after each experimental session, including one occurring the day after an experimental session. Subjects will express, understand and connect any of their thoughts or feelings about PTSD symptoms and their causes, and they will discuss their experience during experimental sessions with the therapists.

Subjects will learn the dose of MDMA they received one month after the second MDMA-assisted psychotherapy session. Subjects who received full dose will complete Stage 1, with a third open-label session, and subjects who received comparator dose MDMA will go on to Stage 2, an open label period of the study that is nearly identical to stage 1, but with one instead of three preparatory sessions and one of two active doses of MDMA used in all three experimental sessions.

Symptoms of PTSD, depression, dissociation, general psychological well-being, sleep quality and potential positive effects of experiencing traumatic events will be measured in all subjects at baseline, one month after the second experimental session and 12 months after their final experimental session, and any subjects reporting pain or tinnitus at the start of the study will record these symptoms throughout the study. Subjects who received the full dose and go on to the third experimental session will complete questionnaires and measures of PTSD and other symptoms two months after the third experimental session. Subjects who received comparator dose MDMA will be tested one month after their second Stage 2 experimental session and two months after the third experimental session. Measures of cognitive function will be given to subjects in Stage two months after their third experimental session, and to Stage 2 subjects two months after their
third Stage 2 session. People will also complete measures of their experience of the experimental session soon after each experimental session. At least 12 months after their final Stage 1 or Stage 2 session, measures of PTSD symptoms, other symptoms, sleep quality, general well-being and and posttraumatic growth will be assessed again, and subjects will complete a questionnaire on the benefits and harms of study participation and other life events and views related to study participation.

This study will compare the effects of MDMA-assisted psychotherapy with comparator versus full dose MDMA, and it will also assess the duration of any changes in symptoms a year after MDMA-assisted psychotherapy.

A Randomized, Double Blind, Placebo-controlled, Parallel Group Study to Determine the Efficacy, the Duration of Action, and Safety of Latanoprost in Patients With Menière’s Disease.

This study is currently recruiting participants.
ClinicalTrials.gov Identifier: NCT01973114
Information provided by (Responsible Party): Synphora AB
Start Date: October 2013
First received: October 17, 2013

The purpose of the study is to evaluate the dose regimen, efficacy and safety of latanoprost for the treatment of Menière’s disease.

A Prospective, Randomized, Double-blind, Placebo-controlled, Multicenter, Phase 2b Study of OTO-104 Given as a Single Intratympanic Injection in Subjects With Unilateral Meniere’s Disease

This study is not yet open for participant recruitment.
ClinicalTrials.gov Identifier: NCT01412177
Information provided by (Responsible Party): Otonomy, Inc.
Start Date: October 2013
First received: July 31, 2011

The purpose of this study is to evaluate the effectiveness of OTO-104 for the treatment of Meniere's disease.