

# Tinnitus Treatments and Managements



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## Abstract

Tinnitus is quite a prevalent symptom among the general population. A proportion of patients suffering from tinnitus seek medical help to reduce tinnitus effects on their daily life. Tinnitus can be so annoying and may cause psychological reactions in the patient. Knowing different treatment and management options might be helpful as studies show that there is no one acceptable treatment effective for all patients. This paper will review some tinnitus treatments and management.

## Introduction

Tinnitus is defined as a phantom sensation of sound in the absence of any external sound source [1]. Chronic tinnitus is more prevalent among elderly [12% after age 60] than in young adults [5% in the 20-30 age groups] but in general, it can happen in any age [2]. Tinnitus sensation in 2-3% of the general population has been found to be debilitating and affect the quality of life. Tinnitus can present with a sleep disorder, hearing difficulty, defect at work and negative emotional reactions. Chronic tinnitus has been reported to be associated with the noise-induced hearing loss in young population due to increasing industrial and social noise [3] or presbycusis. Tinnitus management needs a multidisciplinary approach [4]. Tinnitus can happen without any hearing loss and can have various sounds like ringing, hissing, roaring, pulsing, chirping and clicking. Tinnitus might occur in one or both ears and can be heard inside the head [ASHA].

## Underlying Cause

Tinnitus is not a disorder but it is a symptom of an underlying cause. Therefore determining the underlying cause would be the first part of a comprehensive evaluation. In general auditory system disorders in any level can result in tinnitus. Some of these disorders are impacted wax, ear infection, middle ear tumors, otosclerosis, Meniere's disease, ototoxic drugs, noise-induced hearing loss, eighth nerve tumors, epilepsy, and Migraine. Sudden deafness may cause tinnitus too [5]. Hearing status must be checked by an audiologist. Another factor associated with tinnitus must be checked as well such as blood pressure, kidney function, patients' medications, diet and allergies, emotional stress, etc [ASHA].

## Tinnitus Evaluations

Audiologists can measure tinnitus characteristics such as its pitch, loudness, masking, residual inhibition subjectively. In addition, they measure tinnitus severity by questionnaires like tinnitus handicap inventory [THI]. These questionnaires can be used as outcome measures to monitor treatment effects over time. It also recommended that psychological status of the patient be evaluated by using other inventories [ASHA].

## Tinnitus Treatments

Since tinnitus mostly is a symptom of a problem, the first thing is determining the underlying cause. In addition to checking the hearing status by an audiologist, other medical examinations are mandatory. The most effective treatment for tinnitus is to work on the underlying cause. The underlying cause can be treatable by medical and/or surgical treatment. In many cases, the underlying cause is not identifiable or curable so tinnitus itself might need to be managed. In treating tinnitus two therapeutic targets may be set: 1- changing tinnitus sound itself or 2- changing tinnitus associated symptoms such as anxiety and sleep disorder [ASHA].

Many approaches for tinnitus management and treatment have been suggested. These include medications, vitamin therapy, biofeedback, hypnosis, electrical stimulation, relaxation therapy, counselling, habituation therapies, tinnitus retraining therapy [TRT], cognitive behavioural therapy [CBT], tinnitus maskers and hearing aid. Counselling plays an important role in every type of tinnitus management such as TRT and CBT [6]. Counselling alone or in combination with TRT and CBT can reduce negative reaction to the tinnitus [7]. Audiologists and

otolaryngologists work together in identifying the cause and providing the treatment. One treatment cannot be effective for all the subjects suffering from tinnitus [ASHA].

## Sound Therapy

Sound therapy utilizes a variety of stimuli such as music, speech, white noise, narrow band noise and environmental sounds to simplify the habituation process to tinnitus. The therapeutic sounds can be presented to the users' ears via ear-level devices or can be downloaded to their personal music players. For those individuals with the hearing loss associated with tinnitus, sound therapy techniques may employ hearing aids or custom-made music files based on the users' hearing thresholds [8]. When combined with suitable rehabilitation and counselling sessions, sound therapy enables the individuals suffering from tinnitus to perceive tinnitus in a more manageable level and enables them to reduce the negative impact of tinnitus in their daily life and activities [9,10]. Even most other methods of tinnitus managements use sounds to reduce negative effects of tinnitus and divert patient's attention away from the tinnitus [11].

## Audio logic tinnitus management [ATM]

The method of Audio logic Tinnitus Management [ATM] is described as a sound-based method of tinnitus management for clinical application by audiologists. ATM involves comprehensive tinnitus evaluations and intervention. Intervention includes structured informational counselling and an individualized program of sound enhancement. Sounds presented by hearing aid, ear-level noise generators, personal-listening devices [e.g., wearable CD and MP3 players]. The expanded and updated method is referred to as Progressive Audiologic Tinnitus Management [PATM]. This program has a five-level hierarchical stage [based on patient's needs] [11]. Sounds used for tinnitus management can be divided into soothing sounds, background sounds, interesting sounds. Soothing sounds reduce patient stress and induce relief. Background sounds aim at reducing the contrast of tinnitus percept and environment sounds. Interesting sounds are used to shift patient's attention from tinnitus to an interesting sound. Music, Speech and environmental sounds can be used as any of the mentioned sound categories. This treatment does not intend to mask tinnitus. It is just used for relief and stress reduction [11].

## Cognitive behavioural therapy [CBT]

CBT for tinnitus includes psycho-education about tinnitus, applied relaxation, positive imagery, cognitive restructuring of negative beliefs about tinnitus, exposure to the sounds, behavioural activation, and mindfulness/attention exercises [12,13]. This treatment does not aim at reducing tinnitus loudness or eliminate the tinnitus. It helps patients to cope with tinnitus effects on their quality of life and can reduce reaction to tinnitus [7]. CBT can modify harmful behaviours and thoughts by using "deconditioning" techniques and can reduce arousal levels

through relaxation therapy and changing negative thoughts about tinnitus through cognitive therapy. Evidence is in favour of this therapy [14].

## Tinnitus retraining therapy TRT

TRT consist of counselling, which is based on the neuro physiological model of tinnitus [15] and sound therapy [16-18]. In TRT, sound therapy uses background and interesting sounds. Patient hears both external sound and tinnitus [sound presented at a level just below the mixing point]. This help habituation process. The mixing point is the lower threshold of the "partial suppression" range in which changes in tinnitus spectral characteristics occur [with or without changes in perceived tinnitus loudness]. So the word suppression is used instead of masking [11]. As the TRT protocol utilizes sound stimulation on daily basis for at least 6 hours during 18 months, it is important that the sound be well tolerated by the patient [19]. All patients receive individualized counselling that focuses on using sounds to manage tinnitus. Control trial studies have supported this treatment [11].

## Laser Therapy

As known, the laser has different usages in medicine such as wound healing, nerve and tissue repairing, pain control [20]. Although the exact mechanism of its effect on tinnitus is not clearly understood, it has been proposed that it may be induced by increasing cell proliferation, growth factor secretion, improvement in inner ear blood flow, and/or activation of the hair cells mitochondria [21]. There is still some degree of controversy concerning the efficiency of low-level laser therapy [LLLT] in tinnitus. Some studies have shown positive effects [20-23], but others have found no such effectiveness [24,25].

## Electrical stimulation

Brain stimulation may make some changes in the behaviour. This is based on the assumption that modulating brain rhythms may affect cognitive performance and thus can be used to treat neurological disorders. Numerous studies over many decades demonstrate that low-intensity electrical currents can modulate network dynamics noninvasively in humans. Electrical stimulation has also been applied invasively in humans, either on the cortical surface or as deeply implanted electrodes [26].

## Biofeedback

Biofeedback [BF] therapy has been shown to be one of the treatments of numerous psychological and physiological diseases [27-29]. BF therapy or training is a psychological strategy with which we can control our internal responses voluntarily. It consists of two elements. The first is recognition or knowledge of internal responses and the second is learning control of these responses. These two are based on the operant conditioning. BF instruments sense and amplify the signals from the body and give back the information. The information is used by patients in their conscious efforts to modify or alter specific

physiologic processes [30].

## Mindfulness meditation

Mindfulness characterized by “full attention to internal and external experiences as they happen in the present moment”, and ‘an attitude characterized by non-judgment of, and openness to, the current experience [detached observation of the events] [31-33]. Mindfulness-Based Stress Reduction [MBSR] [33] and Mindfulness-Based Cognitive Therapy [MBCT] can prevent or reduce depression [34]. In 8 weeks, MBSR and MBCT participants learn to cope with the stress by means of cognitive exercises, concentration training, and mental exposure, using a standardized evidenced-based protocol [35]. The MBSR and MBCT protocol comprise both focused attention, open monitoring, and breathing meditation but without the transcending atmosphere of traditional meditative practice [36].

## Medical treatments

There is no drug specifically for tinnitus treatment. As the exact mechanism of tinnitus is unknown, it is hard to develop a medication specific for tinnitus treatment. Drugs might be helpful in reducing sleep disorder, anxiety and depression accompanying tinnitus. In addition to medications, nutritional supplements including magnesium and zinc, ginkgo biloba, homeopathic remedies, and B vitamins have been used with some success in patients with tinnitus. There is not enough evidence to support their effectiveness. Other alternative treatments such as acupuncture, hypnosis, acupressure and naturopathy homeopathy and ear-canal magnets have been studied too but there is no scientific evidence that these remedies are more effective than placebo [37]. In one study Lidocaine and placebo effects were compared in patients with tinnitus and results showed that there was not any significant difference [38]. Medications that can inhibit continuous neural firing caused by glutamate or glutamate antagonists might have some therapeutic effects. Ginkgo Biloba Extract is a powerful glutamate antagonist [14].

Oxytocin is a neurohormone that may also act as a neurotransmitter, produced by magnocellular neurons in the ventricular nuclei of the hypothalamus [39]. Oxytocin plays a complex role in social cognition and behaviour. Important aspects of human social interaction such as social learning, trust, and empathy are influenced by oxytocin [40]. Among other mechanisms, the pro-social effects of oxytocin are mediated by reduction of amygdala activation [41]. Recently, Imaging studies have demonstrated that tinnitus loudness and distress can be reduced by this neurohormone [42].

## Conclusion

Although there are many studies in the field of tinnitus, it seems that there are not enough control trial studies to show the most effective treatments and management. Nonetheless, there

are various treatment and management options available and each patient should receive custom-treatment.

## References

1. Makar SK, Mukundan G, Gore G (2017) Treatment of Tinnitus: A Scoping Review. *The international tinnitus journal* 21(2): 144-156.
2. Dobie RA (2003) Depression and tinnitus. *Otolaryngologic Clinics of North America* 36(2): 383-388.
3. Smith PA, Davis A, Ferguson M, Lutman ME (2000) The prevalence and type of social noise exposure in young adults in England. *Noise and health* 2(6): 41-56
4. Erlandsson S, Hallberg LR (2000) Prediction of quality of life in patients with tinnitus. *British journal of audiology* 34(1): 11-20.
5. Council NR (1982) Tinnitus: Facts, theories, and treatments. National Academies Press, USA.
6. Searchfield GD, Magnusson J, Shakes G, Biesinger E, Kong O (2011) Counselling and psycho-education for tinnitus management. *Textbook of tinnitus: Springer* 535-556.
7. Jun HJ, Park MK (2013) Cognitive behavioural therapy for tinnitus: evidence and efficacy. *Korean journal of audiology* 17(3): 101-104.
8. Nagashino H, Kinouchi Y, Danesh AA, Pandya AS (2009) A neuronal network model for tinnitus and its management by sound therapy. *International Journal of Biology and Biomedical Engineering* 3(4): 43-50.
9. Tyler R, Coelho C, Tao P, Noble W, Gehring A, et al (2008) Identifying tinnitus subgroups with cluster analysis. *American journal of audiology* 17(2): S176-S184.
10. Tyler RS, Chang SA, Gehring A, Gogel S (2009) Tinnitus: How you can help yourself! *Audiological Medicine* 6(1): 85-91.
11. Henry JA, Zaugg TL, Myers PJ, Schechter MA (2008) Using therapeutic sound with progressive audiologic tinnitus management. *Trends in Amplification* 12(3): 188-209.
12. Lindberg P, Scott B, Melin L, Lyttkens L (1989) The psychological treatment of tinnitus: An experimental evaluation. *Behaviour Research and Therapy* 27(6): 593-603.
13. Scott B, Lindberg P, Lyttkens L, Melin L (1985) Psychological Treatment of Tinnitus An Experimental Group Study. *Scandinavian Audiology* 14(4): 223-230.
14. Fioretti A, Eibenstein A, Fusetti M (2011) New trends in tinnitus management. *The open neurology journal* 5: 12.
15. Jastreboff PJ (2004) The neurophysiological model of tinnitus. *Tinnitus: Theory and management* 96-107.
16. Jastreboff PJ, Hazell JW (2008) Tinnitus retraining therapy: Implementing the neurophysiological model: Cambridge University Press
17. Jastreboff P (1999) Editor optimal sound use in TRT theory and practice. *Proceedings of the Sixth International Tinnitus Seminar*.
18. Henry JA, Rheinsburg B, Zaugg T (2004) Comparison of custom sounds for achieving tinnitus relief. *Journal of the American Academy of Audiology* 15(8): 585-598.
19. Barozzi S, Ambrosetti U, Behrens T, Passoni S, Del Bo L, et al. (2017) Effects of Tinnitus Retraining Therapy with Different Colours of Sound. *The international tinnitus journal* 21(2): 139-143.
20. Tauber S, Schorn K, Beyer W, Baumgartner R (2003) Transmeatal cochlear laser (TCL) treatment of cochlear dysfunction: a feasibility

- study for chronic tinnitus. *Lasers in Medical Science* 18(3): 154-161.
21. Okhovat A, Berjis N, Okhovat H, Malekpour A, Abtahi H (2011) Low-level laser for treatment of tinnitus: a self-controlled clinical trial. *Journal of research in medical sciences: the official journal of Isfahan University of Medical Sciences* 16(1): 33-38.
  22. Yıldırım G, Uzun GB, Uğraş H, Saltürk Z (2011) Changes in audiometry results following laser therapy for tinnitus. *European Journal of General Medicine* 8(4): 284-290.
  23. Cuda D, De Caria A (2008) Effectiveness of combined counselling and low-level laser stimulation in the treatment of disturbing chronic tinnitus. *International Tinnitus Journal* 14(2): 175-180.
  24. Teggi R, Bellini C, Piccioni L, Palonta F, Bussi M (2009) Transmeatal low-level laser therapy for chronic tinnitus with cochlear dysfunction. *Audiology and Neurotology* 14(2): 115-120.
  25. Nakashima T, Ueda H, Misawa H, Suzuki T, Tominaga M, et al. (2002) Transmeatal low-power laser irradiation for tinnitus. *Otology & neurotology* 23(3): 296-300.
  26. De Ridder D, De Mulder G, Verstraeten E, Van der Kelen K, Sunaert S, et al (2006) Primary and secondary auditory cortex stimulation for intractable tinnitus. *ORL* 68(1): 48-55.
  27. Budzynski T, Stoyva J, Adler C, Daniel J (1970) Feedback-induced muscle relaxation: Application to tension headache. *Journal of Behavior Therapy and Experimental Psychiatry* 1(3): 205-11.
  28. Brudny J, Grynbaum B, Korein J (1973) editors. New therapeutic modality for treatment of spasmodic torticollis. *Archives of Physical Medicine and Rehabilitation: Wb Saunders Co Independence Square West Curtis Center, Ste 300, Philadelphia, PA 19106-3399.*
  29. Cleeland CS (1973) Behavioural techniques in the modification of spasmodic torticollis. *Neurology* (11): 1241-1247.
  30. House J, Miller L, House P (1977) Severe tinnitus: treatment with biofeedback training (results in 41 cases). *Transactions Section on Otolaryngology American Academy of Ophthalmology and Otolaryngology* 84(4 Pt 1): ORL 697-703.
  31. Bishop SR, Lau M, Shapiro S, Carlson L, Anderson ND, et al. (2004) Mindfulness: A proposed operational definition. *Clinical psychology: Science and practice* 11(3): 230-241.
  32. Brown KW, Ryan RM (2003) The benefits of being present: mindfulness and its role in psychological well-being. *Journal of personality and social psychology* 84(4): 822-848.
  33. Kabat-Zinn J, Lipworth L, Burney R (1985) The clinical use of mindfulness meditation for the self-regulation of chronic pain. *Journal of behavioural medicine* 8(2): 163-190.
  34. Teasdale JD, Segal ZV, Williams JMG, Ridgeway VA, Soulsby JM (2000) Prevention of relapse/recurrence in major depression by mindfulness-based cognitive therapy. *Journal of consulting and clinical psychology* 68(4): 615-623.
  35. (1999) Year F Substance abuse and mental health services administration.
  36. Gotink RA, Meijboom R, Vernooij MW, Smits M, Hunink MM (2016) 8-week mindfulness based stress reduction induces brain changes similar to traditional long-term meditation practice-a systematic review. *Brain and cognition* 108: 32-41.
  37. Hoare DJ, Kowalkowski VL, Kang S, Hall DA (2011) Systematic review and meta-analyses of randomized controlled trials examining tinnitus management. *The Laryngoscope* 121(7): 1555-1564.
  38. Duckert LG, Rees TS (1984) Placebo effect in tinnitus management. *Otolaryngology-Head and Neck Surgery* 92(6): 697-699.
  39. Richard P, Moos F, Freund-Mercier M (1991) Central effects of oxytocin. *Physiological Reviews* 71(2): 331-370.
  40. Meyer-Lindenberg A, Domes G, Kirsch P, Heinrichs M (2011) Oxytocin and vasopressin in the human brain: social neuropeptides for translational medicine. *Nature Reviews Neuroscience* 12(9): 524.
  41. Kirsch P (2015) Oxytocin in the socioemotional brain: implications for psychiatric disorders. *Dialogues in clinical neuroscience* 17(4): 463-476.
  42. Azevedo AA, Figueiredo RR, Elgoyhen AB, Langguth B, Penido NDO, et al (2017) Tinnitus treatment with oxytocin: A Pilot Study. *Frontiers in neurology* 21(8): 494.



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