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Management Options for Individuals with Tinnitus - A Review

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ABSTRACT

Most individuals in a quiet room or after listening to loud music, report of hearing sounds in their ears or head, which are referred to as tinnitus. Over the years several treatment options have been developed for reducing the effects of tinnitus on psychological and health aspects of individuals and further improve their quality of life. However there is no particular treatment which completely eradicates tinnitus. Most of the times there is a need to use more than one technique for positive outcome from the patient, be it medical, behavioral or sound therapy. This review article accommodates rudimentary information on variety of traditional and modern management techniques available in treating tinnitus which might help the concerned professionals in planning an effective management program by selecting the appropriate technique or a combined approach for better prognosis. It also paves a path for research in planning outcome studies in tinnitus management.

Introduction:

Approximately 17% of the world population is troubled by tinnitus and it has severe manifestation in 20% of cases, leading to significant suffering in 4% of them (Steinmetz et al, 2009). Tinnitus may be associated with considerable psychological distress such as anxiety, depression, irritability, and sleep disturbance (Ramkumar and Rangasayee, 2010). The term tinnitus is derived from the Latin word "*tinnire,*" meaning "to ring." Tinnitus is a conscious expression of sound that originates in an involuntary manner in the head of its owner, or may appear to him to do so (McFadden, 1982).In International Classification of Function, Disability and Health (ICF 2001) tinnitus is coded as a separate condition and is defined as a 'sensation of low-pitched rushing, hissing, or ringing in the ears.'

There is considerable variation in tinnitus expression, its etiology and its effects on patient's life. Tinnitus may be triggered or originated from within the structures of auditory system or from para-auditory structures and it may be a pointer to understanding pathological conditions. About 300 diseases may have tinnitus as one of its manifestations, which may be classified according to the affected region as, peripheral, central, extra -auditory or of unknown origin. It can impair the quality of life of individuals and their family leading to social and psychological complications (Davis, El Rafaie, 2000).

The prevalence of tinnitus increases with age (Ahmad and Seidman, 2004). Tinnitus has been found to affect more men than women (Lockwood et al., 2002). Approximately 25% of patients with tinnitus report an increase in severity over time (Stouffer and Tyler, 1990). A population-based study of hearing loss in adults aged 48 to 92 years found that tinnitus had a prevalence of 8.2% at baseline and an incidence of 5.7% during a 5-year follow-up (Nondahl, Cruickshanks, Wiley, Klein, Klein, Tweed, 2002). According to the American Tinnitus Association (2009), 50 million Americans have tinnitus, 12 million of whom seek medical attention. One million have severe disorder which interferes with their quality of life. While exact data on prevalence of tinnitus in India is not available, it is estimated that 4.5 millions of patients suffer from Tinnitus (retrieved from www.tinnex.in).It is extrapolated that in India out of 1,065,070,607 people across the country an estimated population of 47,928,177 may have tinnitus. These prevalence extrapolations for tinnitus are only estimates, based on applying the prevalence rates from the US (or a similar country) to the population of India (retrieved from www.rightdiagnosis.com).

Various classifications of tinnitus have been proposed by various researchers. Classification of tinnitus helps in the process of diagnosis and selecting the optimal treatment option for the disorder. The following flow chart shows the classification of tinnitus.

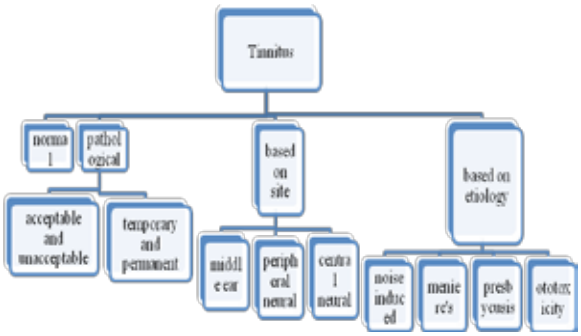

Fig1: Classification of tinnitus ((Dauman and Tyler, 1992).

Tinnitus can also be divided into two broad categories, subjective and objective tinnitus. It is audible to anyone in addition to the affected individual which is associated with different vascular etiologies ,muscular spasms and Eustachian tube dysfunction(Liyanage et al., 2006).On the other hand, subjective tinnitus is not associated with any physical noise and is only audible to the affected individual and it is a manifestation of Presbycusis . Prolonged Noise exposure, Otosclerosis, Infections, Autoimmune hearing loss, Meniere's disease, Neoplasms, Genetic predisposition, Ototoxicity, Vascular, Metabolic and head or neck injury. As a symptom, it may be associated with a number of conditions like ranging from impacted wax to acoustic tumors that warrant medical attention (Heller, 2003). According to the American Tinnitus Association (ATA), noise exposure is the largest attributed cause of tinnitus.

Numerous structures within the auditory system and neighboring anatomical regions could contribute to the generation of tinnitus, but at present no test can identify these regions accurately (Brix, 1995; Hazell, 1995).Various theories have been proposed to explain the pathophysiology of the origin of the tinnitus s (Baguley, 2002; Eggermont, 2000; Kaltenbach, 2000; A. R. Møller, 2003; Vernon & Møller, 1995). Current consensus is that tinnitus results from aberrant neural activity in the auditory system, generally of excitatory nature (Jastreboff, 1990) and interpreted as sound by the auditory cortex (Sanchez, Lorenzi, Brandao, Bento, 2002).

Tinnitus may cause emotional and psychological imbalances which affect the quality of life of the individual as well as his/her family. There are individual variations in the perception of tinnitus, and intrinsic and extrinsic factors such as personality, psychosocial factors, and environment contribute to the patient's tinnitus reaction (House, 1981). Some patients barely notice tinnitus, whereas others are severely affected by difficulty with concentration, sleep disturbances, anxiety, depression, or despair (Tyler & Baker, 1983).

Various assessment procedures have been developed to measure the severity, type and frequency, so that it helps in management of tinnitus. The individual should undergo both medical and audiological evaluations like pitch and loudness matching to external tones minimum masking levels, and measure of residual inhibition for identifying the underlying problem which causes tinnitus. Several questionnaires and self-assessment tools have been developed to assess the severity of tinnitus and the problems faced by the individuals with tinnitus in daily life, on the other hand, aging population and an increasingly noisy society, the prevalence of tinnitus is expected to increase [Davis, Refaie. 2000 and Vernon, 1998] and hence more individuals will be looking for tinnitus management services, especially as treatments are determined to be useful and become free for the public domain. Indeed management of tinnitus is less focused and based on an individual approach and there is no single treatment or regimen for it, till date these helped in reducing the effects of tinnitus, to live with tinnitus and to improve the quality of life of the individuals. Well controlled management strategies are only some and success rates of most treatments remain controversial. There are chances that sometimes the effects of tinnitus are treated instead of tinnitus, which might alleviate tinnitus. So care should be taken while planning an effective treatment for tinnitus after considering all the available options. In today's clinical environment ethical practice requires clinicians to provide information about success and complications of treatment (McKenna & Irwin, 2008). For tinnitus patients the decision whether to undertake one treatment or another is complicated due to lack of data outlining the treatment effectiveness & absence of a clear gold standard treatment (Dobie, 1999). This article provides the various treatments options available to date for reducing the effects of tinnitus on individuals and their daily life, which in turn helps the professionals to plan effective intervention plans , which are discussed below:

Management options for tinnitus:

Hearing Aids:

Many tinnitus management techniques advocate the use of hearing aids (HA's) both for masking (Hazell et al1985; von Wedel et al1998; Vernon & Meikle, 2000) and habituation based tinnitus therapies such as tinnitus retraining therapy (Jastreboff & Hazell1993; Formby & Keaser 2007).

Providing sound therapy through HA's may reduce tinnitus in several ways (Kochkin & Tyler, 2008). Amplified sounds may increase the level of neuronal activity, which reduces the contrast between tinnitus and background neuronal activity; the amplification of speech and ambient sound to a comfortable level may reduce tinnitus audibility and awareness, by interfering with the central processing of tinnitus thus reducing the attention paid to it (Parra & Pearl mutter, 2007). High proportion of hearing professionals (88%) see hearing aids as their primary tinnitus treatment strategy (Kochkin & Tyler, 2008) but very few patients (24%) see hearing aids as an option they would self select (Aazh et al, 2009).

A study conducted by Dalbhanjan, Thejesh, Prakash and Ravichandran, (2011) is aimed to quantify the effectiveness of hearing aids as a tinnitus treatment option by measuring and comparing the pre and post- intervention scores of Tinnitus Handicap Questionnaire. A total of 15 subjects within the age range 25 to 60 years with moderate to severe sensorineural hearing loss participated in the study. This study demonstrates the reduction in patient's tinnitus handicap suggesting that HA's are effective tinnitus management tools but this was observed only during the period when the individual with tinnitus wears the hearing aid and this treatment option cannot be used for individuals with tinnitus but without hearing loss.

Cochlear Implants :

Suppression of tinnitus by electrical stimulation via a cochlear implant (CI) has been studied in recent years. Some individuals who undergo CI surgery report total or partial relief of the symptoms even in the contralateral ear. The mechanisms involved in this suppression are not clear (Yonehara, Mezzalira, Porto, Bianchini, Calonga, Curi, Stoler, 2006). If a CI is successful and allows the patient to hear some external sounds, this usually reduces the perception of tinnitus, especially on the implanted side. Numerous studies reported that cochlear implants reduced or suppressed tinnitus for a majority of patients who experienced tinnitus prior to implantation (House & Brackmann, 1981; Tyler & Kelsay, 1990; McKerrow et al, 1991; Souliere et al, 1992; Ito, 1997; Dauman, 2000; Ruckenstein et al, 2001). CI's cannot be considered a treatment option for tinnitus because a cochlear implant is done only if the individual with hearing loss is having no benefit with a hearing aid, and it is a very costly affair, especially in developing countries like India.This benefits only an individual with hearing loss, so covers only a part of the population who complains of tinnitus.

Sound Generators and Masking:

The use of an externally produced sound to severity of tinnitus can offer relief for few individuals. Tinnitus maskers generate noise bands, preferably with user-adjustable frequency emphasis, to permit the user to select the optimum noise band for achieving ''coverage'' or masking of the tinnitus at the lowest possible sound level. With masking, the purpose is not to cover up, or "mask," the patient's tinnitus. The purpose is to use sound to achieve a sense of relief from the stress or tension caused by tinnitus (Hobson, Chisholm, El Refaie, 2010).

Sound generators are particularly useful when placed by your bedside because they can distract you from your tinnitus. An ear-level sound generator may be recommended for normal hearing or mild hearing loss. For more severe hearing loss, some hearing aids have built-in sound generators known as combination instruments. The effectiveness of this treatment is also present only when the device is on, though some devices produce residual inhibition where the individual might not perceive the tinnitus even after the sound generator is turned off.

Tinnitus Retraining Therapy (TRT):

TRT is a treatment program developed based on the model proposed by Jastreboff, 1990. It consists of acoustic therapy and counseling. This model is incorporated to help and counsel the patients to retrain their autonomic nervous system, so that they will not develop negative reactions towards tinnitus. The combination of sound therapy and counseling with TRT is designed to lead to habituation, meaning the patient does not normally pay attention to the tinnitus and does not react to it when it does come into consciousness. (Phillips, McFerran, 2010, (Jastreboff, Hazell, 1993). It is one of the widely used treatment option and proved to be effective for many of the individuals with tinnitus as it uses two modalities and helps the individuals in retraining their autonomic nervous system. But this treatment might take 3 months to 3 years for the individual to cope up, which is a very long period. So research should be done to improve the technique so that the time required to train the individual can be reduced.

Sound stimulation therapy during sleep:

This is a new strategy for treating subjective tinnitus so that it provides treatment during sleep without interfering with the patient's daytime activities (Pedemonte et al., 2010). The stimulus is a sound that was fixed at the same tinnitus intensity and then applied through an iPod or any device which is compatible to the stimulus. They proposed that the sound stimulation with the same characteristics in frequency and intensity as the tinnitus is a way of reinstalling the normal balance in the central level processing of information. It was based on the acknowledgement that the auditory system also works during sleep, processing the incoming information.

Neuromonics Tinnitus Treatment:
The treatment addresses the audiological, psychological and neurological aspects of tinnitus disturbance. It delivers a spectrally modified acoustic signal. This means that the music is digitally adjusted to compress some low frequencies and expand some high frequencies, while still maintaining the music's artistic integrity. The relaxing music is metered to mimic a resting heart rate. The signal is customized for each ear based on hearing levels from 250 Hz through 12,500 Hz. Since the device is customized based on each person's hearing and tinnitus profile, it compensates for hearing differences between the ears and ensures a high degree of neural stimulation from the music (Meltzer, 2007). It is a combination of acoustic stimulation with a structured program of counseling and support by a clinician who has been trained specifically in tinnitus rehabilitation (Davis, Wilde, Steed, et al., 2008). Neuromonics treatment follows the procedure of TRT but in a more structured way taking into account the differences in hearing between two ears, this provides chances of a better improvement in the individual with tinnitus.

Ultra high frequency vibration therapy:
Ultra quiet, is a high-frequency bone conduction therapy that aims to reduce long term tinnitus severity by delivering amplitude modulated musical type tones in the range of 10-20 kHz. This based on the assumption that high-frequency masking should provide effective relief in persons with severe problematic tinnitus (Goldstein, Lenhardt & Shulman, 2005). High frequency stimulation aims at slowing down and reversing the process of cortical reprogramming, possibly even leading to the restoration of a normal frequency map.

Pharmacological Treatment:
Antidepressants likely to have a role in the management of tinnitus concomitant with major depression or depressed symptoms and can help in ameliorating comorbities in severe or chronic cases of tinnitus. The sedating tricyclic medications have been reported to be useful in patients with insomnia. GABA receptor-binding medications, like benzodiazepines appear to be reasonable candidates for tinnitus therapy. Prostaglandins and other vasodilators have been studied clinically and were reported to have mixed results (Patterson and Balough, 2006).

There is no FDA-approved drug treatment for tinnitus. However, various pharmacological treatments, including antidepressants, anxiolytics, vasodilators and vasoactive substances, and intravenous lidocaine have been prescribed for tinnitus (Baldo, Doree, Lazzarini, et al., 2006, Jalali, Kousha, Naghavi, et al., 2009, Kalcioglu, Bayindir, Erdem, et al., 2005, Agarwal, Pothier, 2009). The anticonvulsants such as mysoline may affect some patients who have tinnitus due to 8th nerve irritation. Mysoline (Primidone) contains phenobarbital, which is sedating.

A latest treatment has been launched for tinnitus in India named Tinnex. This injection consists of 160mg of caroverine hydrochloride in 8ml ampoule and is used for treating cochlear synaptic tinnitus. But the effectiveness of this drug is questionable and has to be studied extensively. Even though various drugs have been used to treat tinnitus no drug has been proved to completely cure the tinnitus and its side effects.

Surgical treatment:
Surgery may be performed in order to attend to an underlying process or disease which might lead to tinnitus. Surgical treatment of tinnitus includes destructive procedures such as neurectomies, stapedectomies and tympanosympathectomies. Translabyrinthine procedures for the removal of acoustic neuromas and sectioning of the eighth nerve to eliminate vertigo are analogous to cutting the eighth nerve as a surgical intervention for tinnitus (House & Brackmann, 1981).

Temporomandibular Joint Treatment:
Tinnitus, vertigo, and otalgia are symptoms that have been linked to temporomandibular joint (TMJ) disease (Tuz, Onder, Kisnisci, 2003). A study was carried out to investigate the presence of symptoms and signs of temporomandibular disorders (TMD) in patients with tinnitus and to evaluate the effect of TMD treatment on tinnitus in a long-term perspective in comparison with a control group of patients on a waiting list. It was found that TMD symptoms and signs are frequent in patients with tinnitus and that TMD treatment has a good effect on tinnitus in a long-term perspective, especially in patients with fluctuating tinnitus (Tullberg and Emberg, 2006). Research showed that TMD treatment has positive effect on tinnitus, but this is only in individuals who have tinnitus associated with TMD.

Transcranial Magnetic Stimulation (TMS):
TMS is a relatively new depression treatment approved by the Food and Drug administration in 2008. It is believed that high spontaneous neuronal activity in the central auditory system and associated areas may responsible for the perception of tinnitus, which was found by using functional magnetic resonance imaging (fMRI) and positron emission tomography (PET) techniques. TMS, although not commonly used, delivers an electrical field to the cerebral cortices modulating the excitability in the area of the cerebral cortex believed to be associated with tinnitus (Langguth, Hajak, Kleinjung et al, 2006) and decreases the neuronal activity (Meng, Liu, Zheng, Phillips, 2011).

Kleinjung, Steffens, Sand, Murthum, Strutz, Langguth, Eichhammer (2007) conducted a study to determine the factors that predict a beneficial outcome with rTMS treatment. Forty-five patients with chronic tinnitus underwent 10 sessions of low-frequency rTMS to their left auditory cortex. The treatment outcome was assessed with a tinnitus questionnaire. Therapeutic success was related to the patients' clinical characteristics. A significant reduction in tinnitus complaints occurred after rTMS. In the questionnaire, 40% of the patients improved by five points or more. Treatment responders were characterized by shorter duration of tinnitus complaints and no hearing impairment.

Even though TMS is effective in most of the patients the side effects, availability and success rate of this technique is questionable. TMS is reported to induce the conditions following the treatment like seizures, fainting, minor pains such as headache or local discomfort, minor cognitive changes and psychiatric symptoms (Rossi, Hallett, Rossini, Pascual-Leone, 2009) The effectiveness of this technique should be proved on a larger population before considering this as a part of tinnitus intervention programme.

Complementary and Alternative Medicine Therapies:
Complementary and alternative medicine (CAM) is the term for medical products and practices that are not part of standard care. A variety of nutritional supplements have been advocated to treat tinnitus, including minerals such as magnesium or zinc, herbal preparations such as ginkgo biloba, homeopathic remedies, and B vitamins (Seidman & Babu, 2003). Gingko Biloba is an herbal supplement derived from the Chinese Maidenhair tree used to increase blood flow, inhibit the platelet-activating factor, alter neuron metabolism, and prevent free radicals from damaging cell membranes. Ginkgo biloba, provided significant improvement for tinnitus patients (Coles, 1988). Recent reports showed that Ginkgo biloba extract alone or combined with Bhramari Pranayama have positive effects on tinnitus (Pandey et al., 2010). Acupuncture has not been demonstrated to be efficacious as a treatment for tinnitus on the evidence of rigorous randomized controlled trials (Park, White, Ernst, 2000). Controlled trials study conducted on acupuncture as a treatment for tinnitus found that acupuncture to provide effective relief from tinnitus (Tan 2007, Okada 2006, Azevedo 2007).

Hyperbaric Oxygenation permits a controlled increase of the partial oxygen pressure in the blood. This technique can be used in cases of tinnitus and sudden deafness when the development in the inner ear and the brain lead to a lack of oxygen. .According to biophysical laws the pressure of oxygen in the blood depends directly on the pO2 of inhaled air (Bohmer, 1997). This therapy, which is used to treat a variety of medical conditions, requires that the patient to sit inside a pressured chamber containing an atmosphere of 100 percent oxygen, which increases the oxygen supply to body tissues. Ultrasound (Rendell, Carrick, Fielder, Callaghan, & Thomas, 1987), and low power laser (Na-

kashima et al., 2002) can also be used to treat tinnitus. Various treatments are available as a part of CAM, but these treatments cannot be used solely, they have to be used in combination with other techniques to produce a better effect on the individual and the complete effectiveness of these techniques is questionable.

Cognitive and Behavioral Therapy :
Cognitive behavior therapy (CBT) uses techniques such as cognitive restructuring and relaxation to change the way patients think about and respond to tinnitus. CBT can help to relieve your negative associations to tinnitus, can reduce stress and annoyance caused by tinnitus and can redirect your attention from the tinnitus sound. Individuals with tinnitus may experience difficulties with attention and anxiety, but those who are most distressed by tinnitus may be psychologically vulnerable (Langguth, Kleinjung, Landgrebe, 2011).

Interventions such as cognitive behavioral therapy may effectively increase quality of life by increasing the patient's ability to deal with chronic tinnitus by restructuring thought patterns and habituating those patterns when the patient is reacting to tinnitus (Martinez-Devesa, Perera, Theodoulou, 2010). Henry and Wilson (2001) reviewed the studies that have been conducted to evaluate the efficacy of cognitive–behavioral therapy for tinnitus distress. They concluded that these studies offer ''considerable support'' for using this form of treatment. CBT cannot be used as the only technique to reduce the tinnitus as it does not reduce the loudness of the tinnitus. This technique is more effective when used along with other techniques like sound therapies by reducing the disturbances caused by the presence of tinnitus in their personal and social life.

Biofeedback therapy:
Biofeedback was advocated for tinnitus treatment in the 1970s (Grosson, 1976). Biofeedback technique aim to teach the patient to control or habituate to the perceived ringing and the subsequent distress. Biofeedback is a relaxation technique that helps control stress by changing bodily responses. Electrodes attached to the skin feed information about physiological processes such as pulse, skin temperature, and muscle tension into a computer, which displays the output on a monitor. Patients learn how to alter these processes and reduce the body's stress response by changing their thoughts and feelings. Listening to the audio signal is thought to reduce the perceived ringing and muscle tension. In a study, conducted at Cornell University, treated seven subjects with chronic tinnitus of moderate to severe intensity with a five month program of weekly biofeedback sessions. The results showed no change in tinnitus loudness but all patients gained satisfaction from the training. Three patients (43%) reported substantial psychological benefits in coping with tinnitus, two (28.5%) described moderate improvement and two (28.5%) experienced modest gains. This technique helps the individuals to cope with the tinnitus when used along with other techniques by reducing the psychological symptoms of tinnitus.

Relaxation Therapy:
Relaxation therapies also offer strategies to focus the patient's attention away from the sound, aiming to psychologically improve their symptoms (Ireland, Wilson, Tonkin, et al., 1985). This technique helps in improving the quality of life of the patient. Relaxation therapy as mentioned above cannot be used solely; it should be used along with the techniques which help in reducing tinnitus severity. These techniques help to relive the other effects of tinnitus like stress, insomnia and other psychological disturbances.

Neurofeedback therapy:
Neurofeedback is a computerized learning strategy that enables people to voluntarily alter their own brain activity. Chronic tinnitus sufferers have different patterns of brain activity compared with those with normal hearing (Weisz et al., 2005). Many individuals with tinnitus have abnormal oscillatory brain activity. This pathological activity can be normalized by neurofeedback techniques (Weisz et al., 2005). This is achieved mainly through enhancement of tau activity (8-12 Hz activity as tau activity). Enhancing Alpha frequencies and cutting down Delta activity using neurofeedback have shown some success in reducing tinnitus (Crocetti et al., 2011). It has also been reported that the use of neurofeedback therapy to manipulate cortical networks can be helpful in reducing tinnitus loudness and distress (Schlee et al., 2008).

Virtual reality therapy:
This technique acts on the sub-cortical mechanisms of integration, thus allowing the patient to willingly manipulate the tinnitus in a visual and auditory 3-Dimensional (3D) virtual environment to control or "master" tinnitus (Londero et al., 2010). The overall procedure consists of, in the first place, the creation of an auditory avatar (auditory image of patient's tinnitus), and secondly, the inclusion of an interactive auditory–visual virtual environment where the different audio components are spatialized according to the navigation and manipulation of the patient. Londero et al. (2010) believed that immersion in virtual reality can contribute to tinnitus treatment by promoting plasticity, through the active manipulation of a 3D auditory object linked to a visual representation. Repeated sessions of such virtual reality immersions are then supposed to contribute to tinnitus treatment by promoting cerebral plasticity (Pandey, 2011). Further, clinical research is necessary to demonstrate the clinical relevance in alleviating tinnitus.

Bhramari Pranayama (BP):
A yogic technique, Pranayama, is a method of controlling "prana" or life force through the regulation of breathing. Pranayama is an important aspect of yoga that deals with the connection between breathing patterns and emotional states (Fried, 1993). These techniques aim at reducing anxiety levels in individuals, increasing parasympathetic activity in the milieu of the autonomic nervous system and at times actually inducing great muscular stretching through specific body postures. Paroxysmal Gamma brain waves produced during the BP (Vialatte et al., 2009) which is associated with positive thoughts, feelings of happiness and acts as a natural antidepressant and can also be used as a self-induced sound therapy for treating tinnitus has rarely been reported (Pandey et al., 2010).

Application of BP has been demonstrated to provide significant levels of relief in tinnitus. In BP, pressing of the eyeballs leads to stimulation of the vagus nerve which in turn leads to activation of the parasympathetic nervous system (PNS).Under the relaxing effects of PNS, autonomic nervous system facilitates to decrease the stressing effects of sympathetic nervous system and channels it towards more relaxed PNS(Zabara,1992). Reorganization or rearrangement of neural synapses (plasticity) is depicted by the direct correlation observed in the activation of PNS and the reduction of tinnitus and its associated negative emotions (Alkadhi et al., 2005).It is reported that BP not only suppresses the sound of tinnitus, but it also effectively reduces the irritation and annoyance caused by the sound in tinnitus patients. It is generally accepted that no single technique proves to be effective in all cases of tinnitus. However, the combined therapeutic approach has significant effects in the management of tinnitus (Pandey et al., 2010).

Progressive Tinnitus Management:
The Progressive Audiologic Tinnitus Management model is based on a series of clinical studies that were completed at the National Center for Rehabilitative Auditory Research (NCRAR), and on many years of clinical experience with veteran tinnitus patients. The goal of intervention with PTM is for patients to learn how to develop and implement individualized plans to manage their reactions to tinnitus. These plans involve the use of therapeutic sound and coping techniques. PTM uses elements of hearing aids, masking, TRT, and cognitive behavioral therapy. There is a level of participation required of patients—they are expected to be engaged in the "collaborative self-management" process (J.A. Henry, Zaugg, Myers, Kendall, et al., 2009).

Counselling:
The cornerstone of most tinnitus treatments is counseling (Tyler, 2006). As there is no particular treatment which reduces the effect of tinnitus, one has to follow a group of techniques and should determine which technique leads to improvement. Pa-

tients also play an important role in this process and they can be educated regarding tinnitus and how to self manage it. It is especially important that patients are taught strategies to self-manage their tinnitus. Patients need to learn how to help themselves for potentially a lifetime of tinnitus management.

Conclusion:

The current review article reviewed various treatment options that are available in the present day to reduce the effects and severity of tinnitus on individuals. Even though there are many options with which the individual with tinnitus can be treated, the effectiveness of these treatment options is questionable and individualized. The research done on proving the effectiveness of these techniques showed mixed results which left the clinicians to choose a group of available options to see which technique has better improvement or sometimes they might have to use a combination of techniques. The efficacy of most interventions for tinnitus benefit remains to be demonstrated conclusively (Hoare et al 2011). In particular, high-level assessment of the benefit derived from those interventions most commonly used in practice, namely hearing aids, maskers, and tinnitus retraining therapy needs to be performed." Antidepressants were the only drug class to show any evidence of potential benefit. Through this one can conclude that there is no particular treatment through which the severity and effect on tinnitus on individuals can be reduced or removed completely. So, one has to follow the most effective treatment option to the particular individual out of the available treatments and should remember that all the individual with tinnitus may not respond the same way to one particular treatment. The research should be continued in proving the available treatment options on larger population and also to develop new options which will help the clinicians to cut down the effects on tinnitus on one's quality of life.

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