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OTHER ARTICLES

Prevention and Rehabilitation of Old Age Deafness

M. K. Taneja[1]

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Abstract Hearing impairment is one of the most common sensory deficit affecting 466 million people globally and in majority of old age people it can not corrected. Since presbycusis is always associated with diminished cognition power resulting in two fold loss in understanding of speech. There is no treatment available till date to regenerate the hair cells but certainly we can augment hearing by preventing and regenerating (apoptosis) atrophy of stria vascularis, spiral neural cells degeneration, atrophy of auditory nerve and cerebral cortex by modified greeva, skandh chalan, dynamic neurobics, tratak (focused concentration), Bhramari, Kumbhak along with mindful relaxation technique.

Keywords Apoptosis · Presbycusis · Old age deafness · Noise · Vitamin D · Bhramari pranayam · Kumbhak · Oxidative stress · Antioxidant · Greeva chalan · Skandh chalan · Dynamic neurobics · Tratak

Introduction

Hearing is an essential sensory sense of an individual for development of speech which is crucial for verbal communication and personality development. Hearing impairment is one of the most frequent sensory deficit in human being. It is the second most common form of disability after locomotor disability in India [1].

✉ M. K. Taneja
tanejaentcenter@gmail.com

[1] Indian Institute of Ear Diseases, E-982 C. R. Park, New Delhi, India

Around 466 million people worldwide have disabling hearing loss adult 432 million and 34 million of these are children. It is estimated that by 2050 over 900 million people will have disabling hearing loss. 60% of childhood hearing loss is due to preventable causes. 1.1 billion young people (aged between 12–35 years) are at risk of hearing loss due to exposure to noise in recreational settings [2].

Disabling hearing loss refers to hearing loss greater than 40 dB in the better hearing ear in adults and a hearing loss greater than 30 dB in the better hearing ear in children. The majority of people with disabling hearing loss live in low and middle-income countries [3].

Understanding speech is more meaningful compared to perception of sound. It affects the activities of life and comprehension of social communication. It depends upon how psychophysical aspects are recognized and discriminated on the cerebral cortex [4].

Presbycusis is the term used for aging hearing loss characterized by decreased hearing sensitivity, reduced speech recognition, decreased processing of acoustic impulses. Speech discrimination is poor in noisy surrounding. There is high frequency hearing loss usually bilateral, symmetrical and associated with tinnitus. The most overlooked precipitating factor is smoking, tobacco chewing, work stress, imbalanced diet leading to atherosclerosis, cervical spondylitis (ischemia of the vertebral artery) and diabetic neuropathy.

It is a usual belief that perception of speech is an auditory function; hence, we assume in senior citizen with sensorineural hearing loss (presbycusis), nothing significant can be done if hearing aid is not acceptable or does not add clarity to speech perception. It is essential to find out reversible and preventable causes. Inflammation is involved which leads to tissue injury through vasospasm which is reversible. The question in mind is can we

rehabilitate these senior citizens with visual speech perception [5] by learning lip reading, activation of nondominant brain and mid brain by generating alpha brain waves. It has been observed that a visual speech stimulus can augment the hearing in noisy environment [6]This has been observed by functional magnetic resonance imaging (FMRI) that visual speech stimulates the cortical auditory area [7]. The perception of visual speech stimuli varies with the individuals and can be activated by practice which is by multimodal perception, a neuroplastic effect by sensitization or taking over of cerebral auditory cortex by surrounding brain tissue. The art of identifying the phonemes by vision is termed as viseme. We can explain it by example, the differentiating unit in bad/bat, d/t is phoneme and perceiving the expression of the face (lip) is visemic. The speed of sound is 343 meters per second while speed of light is 299,792,458 meters per second; hence, vision is 874,000 faster and early than sound stimulating the auditory cerebral cortex. The visual effect of lip reading and prosody (facial and body gestures) affect and influence the perception of heard speech. Interpretation of phonemes at auditory cerebral cortex is by multimodal multicenter brain activation [8] and by audio visual integration [9]. The core area for the visual speech perception are facial fusiform area in the right lateral portion of fusiform gyrus, occipital face area, and posterior superior temporal sulcus [10]. These observations have been confirmed by FMRI that every psycholinguistics' speech structure visemic (phonetic features), phonemes, syllables words, and prosody may be perceived visually by visual cerebral cortex area. This has been further confirmed by electroencephalography/electrocorticography that audiovisual processing and integration take place in non primary cortical areas.

Apoptosis in Hair Cells

Apoptosis is a genetically controlled mechanism. Initiated by loss of growth factor, radiation and low cellular oxygen level (intracellular hypoxia) leading to mitochondrial DNA damage and activation of caspases and other enzymes resulting in cellular death [11].

Oxidative stress is an imbalance between production of reactive oxygen species (ROS) and detoxification of their reactive intermediates. Oxidative stress is a pathophysiological process leading to oxidative damage in cells, tissues, or organs by damaging lipids, inhibiting protein synthesis. Now it is believed that aging and aging deafness is the process of apoptosis by accumulated oxidative damage by ROS [12, 13]. The ROS are molecules with one or more unpaired electrons. Mitochondria to produce energy (ATP) combine oxygen and glucose [14]. Free radicals (ROS) arise as by product of metabolic process. The production of ROS increases with age leading to all age related diseases. ROS singlet oxygen, hydrogen peroxide, hydroxyl radicals, superoxide anions are generated by the mitochondria as a result of altered cellular metabolism which are usually detoxified by antioxidants. Since production is at mitochondria it affects the mitochondrial DNA specifically telomere of DNA. Altered levels of antioxidant enzymes lead to triggering of cell death of hair cells, stria vascularis and sensory neural degeneration [15, 16]. Antioxidants are substances that neutralize or remove these free radicals by donating an electron.

The basic etiology of enhanced ROS is free radicals or free surplus oxygen in the body. Mostly in the plasma and extracellular space. This is due to rapid shallow breathing retarding production of ATP from 38 units to 2 units which hampers the cellular repair and metabolism. These free radicals leads to vasoconstriction of end arteries leading to hypoxia, ischemia, infarction and necrosis of cells. The autoimmune induced inflammation is associated with vasospasm induced hearing loss and is potentially reversible [17]. Now it is evident microvascular dysfunction is associated with sudden sensorineural deafness which can be measured by video capillaroscopic examination [18].

Spiral ganglion cells are essential for the process of hearing in healthy as well as in cochlear implanted. Now we can protect and perhaps enhance Spiral ganglion neurons by neutrophil factors, antioxidants and electrical stimulation [19] and nitric oxide production.

Normal auditory function depends upon inner ear fluid homeostasis. Strial atrophy leads to thickening of basement membrane this is the result of thickening (atherosclerosis) of Spiral modular and vestibulocochlear artery. Which can be prevented and ameliorated. The results have provided compelling evidence for HCO_3^- regulation of apoptosis. Such regulation takes place at post mitochondrial levels, downstream of Bax/cytochrome *c* translocation [20].

it is possible to save neurons and to derive functional benefits in some animal models of acute and chronic disorders and suggest that it may be possible to limit cell death injury and disease to only those cells that are not too far gone, and if intervention is early enough then one may be able to save cells that will ultimately recover fully.

Acoustic Trauma

Loud noise initiate large displacements of the tympanic membrane and in the inner ear. The ROS released from shearing force of loud noise lead to up regulation of P53 in cochlear hair cell death hence to prevent this cellular death ROS has to be neutralized by antioxidant available. Naturally produced antioxidant is carbon di oxide in blood. The

labyrinthine artery constricts during and after noise injury leading to reversible hearing loss.

We can summarize the cause of age related hearing loss is hyalinization of tympanic membrane, poor Eustachian tube function (hampered middle ear impedance) atrophy of stria vascularis, decreased number of hair cells, degeneration of Spiral neural cells, atrophy of auditory nerve & cerebral cortex. Out of this only hair cells can not be regenerated but for the rest we can make an attempt to restore though it is a long run exercise.

In old age there is twofold impact on quality of life; one is by impairment of hearing; another is retarded cognition which is memory attention, neural processing, and speed of processing of hearing input. Researchers have proved that hearing impairment and cognitive decline are associated; hence, we can predict a better quality of life and somewhat better speech understanding by improving the concentration power, neural network, processing speed, and working memory. This will lead to enhanced processing of auditory information. This can be achieved by focused concentration dynamic neurobics, optimizing the cerebral blood flow by modified cervical, shoulder dynamic neurobics other yogic exercises, modified Bhramari Pranayam [21] and mind full relaxation.

Bhramari Pranayam

It is a breathing exercise; a humming sound is produced during exhalation with an effort to generate the echo in the ears. In modern medicine, higher frequency sounds (ultrasound therapy) is a known modality in the treatment of tinnitus and sensorineural deafness. Apart from restoration of hearing by stimulating the hair cells and generating action potential, it is also quite effective in distressing. Bhramari releases nitric oxide in the body which acts as a vasodilator and increases tissue perfusion. Bhramari increases the production of nitric oxide by 16 times which goes down with aging. Nitric oxide acts by reducing the vasospasm.

Patient is instructed to take a slow deep abdominal breath, lift the tongue and press on hard palate in Khechari Mudra, hold the breath in, blow the cheek for better echo, close both ears with thumbs of both hands keeping them on concha simultaneously blocking the ear (leads to vagal stimulation through Arnold's nerve) and both eyes are gently closed by index finger. The tip of index finger should rest on the lateral wall of nose. Both middle fingers are put on base of ala of nose, and mouth is closed on both sides, upper lip by ring fingers and lower lipby little fingers. Both eyes are focused in Shambhavi Mudra at the Ajna Chakra in between both eyebrows. A constant rhythmic uninterrupted specific frequency sound (mouth closed jaw relaxed) is generated. Spiritual concentration is focused on Dwarika Dhish (Deity). After complete exhalation, hold the breath out; Vahya Kumbhak is enforced with Jalandhar bandha and spiritual focus on Lord Shiva (Deity). Keep holding the breath out as long as possible, give a command to brain that my whole body is revitalizing with improvement in hearing [22]. The exercise can be performed sitting comfortably in calm places, eyes closed, relaxed mood with a smile on face, A high pitch sound gives better results. It also helps in regaining better speech recognition. For better results, whole body, mind and soul should be relaxed eyes are gently closed. You should be able to visualise a faint dusty brown light at solar plexes (Ajna Chakra) matching with the colour of pineal gland. After completing the bhramari hold the breath out for maximum comfortable duration. This optimizes the CO2 level in blood, tissue and cellular level enhancing HCO3 anion leading to apoptosis and revitalization.

Kumbhak (Naadi Shodhan)

Kumbhak is a respiratory exercise which can be justified scientifically as carbogen therapy. Carbogen therapy is a known modality of management in cerebral atrophy, sensorineural deafness and Alzheimer's disease. In carbogen therapy, we provide 5% carbon dioxide (CO) as a stimulant. Increased carbon dioxide level leads to dilatation of the tiny blood vessels, increases their permeability and increases malleability of red blood cells (BOHR's effect). This leads to better oxygenation and better nutrient supply to each cell of the body. It also increases nitric oxide level in the body which further potentiate these actions.

In Vahya Kumbhak we exhale the air from the lungs for the maximum duration and capacity hence increases the blood CO_2 level which leads to stimulation and regeneration of higher centers including limbic system, hearing area and parasympathetic nervous system.

In this exercise sitting comfortably in Sukhasana or on chair with straight trunk and spine, left hand will rest on the left knee in Shunya Mudra and the right hand is used for closing and opening of the nostrils, index and middle fingers are closed, thumb on right ala of nose and right ring finger tip on left ala of nose (Nasagra Mudra).

Nasagra Mudra is symbolic of lord Ganesh and said to activate the mooladhar chakra providing vitality and good physique.

The exercise starts with slow, gradual deep abdominal inhalation to the maximum from left nostril with counting the digits 1–10 (duration 1 unit) filling the lungs entirely. The breath is kept on hold by closing both nostrils and counting 11–50 (duration 4 units) followed by slow

forceful complete exhalation from the right nostril by squeezing the abdominal muscles counting 51–70 (2 units).

For exhalation from the right nostril thumb will be withdrawn and left nostril will be closed by right ring finger. In slow exhalation every bit of air is drawn out forcefully, now both nostrils are closed again for 10 counts from 71–80 (1 unit). One cycle is complete in 8 units (1 + 4+2 + 1) inhalation (one unit) breath holding in (4 units) exhalation (2 units) breath holding out (1 unit). Time of unit exercise (count 6–16) can be modified as per body strength.

For better and higher benefit, eyes are focused in Nasagra Dristhi on the tip of nose, while breathing in (poorak) the silent chanting of 'A' the first component of 'Om' along with recapitulating lord Brahma in red dress. On Antaha Kumbhak (holding breath in) silent chanting of 'O' the middle component of Om along with remembrance of lord Krishna (Dwarikadhish) and during exhalation (Rechak) and holding the breath out (Vahya Kumbhak) silent chanting of 'M' (Makar) with remembrance of bluish colour shining lord Shiva.

This is a power full exercise, increases vital capacity, regulates apoptosis, increases blood supply by dilating the end arteries. This also optimizes the blood pressure and blood sugar levels.

Modified Greeva Chalan (Neck Exercise)

With the growing age, there is some degree of reduced blood supply to brain and labyrinth by compression of the vertebral artery (VA) due to stiffness of neck muscles (cervical Spondylolisthesis). Compression of VA can be minimized by regular cervical (neck) exercise.

Body position The neck exercise can be performed sitting on chair, floor, or on bed margin. Fix the upper half of body by fixing the upper limbs including shoulder by placing both palms firmly on ground, arms of chair, or on thighs so that only neck and head should move, movement below the neck is not allowed. Keep the back straight but relaxed. It is a set of four exercises.

Neck Flexion—Extension Exercise

Start the exercise by slow deep abdominal breath through the nose and by holding the breath in. Tuck the chin into the chest by gently bringing the head downward. Focus physical awareness on the back of the neck and spiritual awareness on Vishuddhi Chakra. Hold the breath in and position to the maximum comfortable duration; give the command that all neck muscles are getting relaxed and there is no spasm and no pain; enjoy and feel the increase in blood flow to the ear and brain along with increased power of hearing. Now come in neutral position and exhale. Inhale deeply and slowly in abdomen. Gently band the head upward and backward, let it go to the maximum with ease. Focus your physical awareness on the back of neck muscles and spiritual awareness on Vishuddhi Chakra. Hold the breath in and position to the maximum comfortable duration; give command that all neck muscles are getting relaxed and there is no spasm and no pain; enjoy and feel the increase in blood flow to the ear and brain along with the increased power of hearing. Exhale and come into the neutral position. Repeat whole of the exercise three more times. Now relax by slow deep abdominal breathing, hold the breath, make sure there is no tension or stress. Give a command that you are feeling comfort and release of spasm of neck muscles with loosening of vertebral joints. Patients of severe cervical spondylitis should start the exercise with extension only, once spasm is released, may go for flexion exercise.

Lateral Flexion Exercise

Start with the slow deep abdominal inhalation, hold the breath in, and fix the shoulders. Flex (tilt) the neck to the right, try to touch your right ear to the right shoulder. Do not lift the shoulder, keep the palms firmly on floor, and be gentle but do with definite stretching. Focus your physical awareness to the back of the neck muscles and spiritual awareness to Vishuddhi Chakra. Hold the breath in and position to the maximum comfortable duration; give the command that all neck muscles are getting relaxed and there is no spasm and no pain; enjoy and feel the increase in blood flow to the ear and brain along with the increased power of hearing. Comeback in the neutral position and exhale. Again take a slow deep abdominal breath now flex the neck to left and make effort to touch left ear to the left shoulder. Hold the breath in and position to the maximum comfortable duration; give the command that all neck muscles are getting relaxed and there is no spasm and no pain; enjoy and feel the increase in blood flow to the ear and brain along with the increased power of hearing. Exhale, and come back into the neutral position. Do not turn or rotate your head. Now relax by slow deep abdominal breathing, hold the breath, make sure there is no tension or stress. Give a command that you are feeling comfort and release of spasm of neck muscles with loosening of vertebral joints.

Head Rotation Exercise

Start with slow deep, abdominal breath, hold the breath in, fix the shoulders, and rotate your head on neck to the right side. Focus your physical awareness to the back of neck and spiritual awareness to Vishuddhi Chakra. Be gentle but try to rotate and stretch to your maximum; hold the breath in and position to the maximum comfortable duration; give the command that all neck muscles are getting relaxed and there is no spasm and no pain; enjoy and feel the increase in blood flow to the ear and brain along with the increased power of hearing. Now, come in neutral position and exhale. Now Relax by slow deep abdominal breathing, hold the breath, make sure there is no tension or stress. Give a command that you are feeling comfort and release of spasm of neck muscles with loosening of vertebral joints, Again take a deep abdominal breath, hold the breath in, rotate your neck to be left be gentle but with definite stretching. Focus your physical awareness to the back of neck muscles and spiritual awareness to Vishuddhi Chakra. Hold the breath in and position to the maximum duration, give command all neck muscles are getting relaxed and there is no spasm and no pain, enjoy and feel the increase blood flow to the ear and brain along with increased power of hearing. Come back to the neutral position. Now Relax by slow deep abdominal breathing, hold the breath, make sure there is no tension or stress. Give a command that you are feeling comfort and release of spasm of neck muscles with loosening of vertebral joints. All these three exercises are performed to the maximum stretch and maximum duration and movement, but with ease, no overstretching or pain; remember all yogic exercises are for relaxation, so smile and enjoy. Giving a command to brain and body and its visualization to act accordingly with positive result is the most important and vital part of yoga.

Neck Exercises with Counter Pressure

Second set of three exercises: performed in the same way but we do not move the head simply apply the counter pressure by the hand on moving head and stretching neck muscles.

360° Head Rotation

It should be performed by the beginners in sitting posture to avoid giddiness and sudden fall. After slow deep abdominal inhalation and holding the breath in, smile and start by tucking the chin into the chest swinging to the left shoulder to back then going to the right side shoulder and coming back forward and downward in the initial position. Repeat three more times. Again a slow deep abdominal inhalation with holding of breath in, repeat the exercise three more times start by rotating the head to the right side shoulder to back then going to the leftside shoulder and coming back forward and downward in the initial position; perform at least three rotation in slow pace but keep smiling and holding the breath in. Now inhale deeply, slowly by abdomino clavicular breathing, exhale fully by squeezing the chest and abdominal muscles. Relax with a positive feeling of relaxation, amusement, better health and improvement in hearing.

Skandh Chalan (Shoulder Exercise)

Sit comfortably on chair or hard comfortable floor preferably in Sukhasana, put both hands on both knees, elbows just touching to the sides of body. Start with slow deep abdominal inhalation and holding the breath in. Focus your physical awareness on back between the shoulder blades and spiritual awareness on Manipura Chakra. Rotate your both shoulders first forward then upward then backward and then downward completing one cycle. Try to do it maximum time steadily in a single breath, repeat your breath if needed. Relax by slow deep abdominal breath, hold it, and give a command that every neck and shoulder muscle is relaxing, there is no spasm, and whole body including ear and brain is revitalized with improvement in hearing. Repeat the shoulder exercise in reverse direction after holding a deep abdominal breath. Both shoulders should go down then posterior, superior, and coming anterior and in the initial neutral position completing one cycle. Do it maximum time in a single breath, repeat your breath if needed. Relax, feel positivity, give a command that all neck and shoulder muscles including ear and brain are revitalized along with the increased power of hearing.

Alternate Shoulder Rotation Exercise

After deep inhalation and breath holding, exercise is performed; right shoulder goes up and left shoulder will go down, and when right shoulder will go forward, the left will go backward, thus completing the cycle; do it maximum time in a single breath. Repeat your breath if needed. Relax, feel positivity give a command that all neck and shoulder muscles including ear and brain are revitalized along with the increased power of hearing. Now perform the exercise in reverse direction.

Note This exercise is a powerful exercise. It revitalizes the body, builds up confidence, alleviates depression,

delays aging, increases cognition power, also prevents from dementia and Alzheimer's disease.

Hastapadasana

Hast mean hand and Paad means foot; hence, a union of hand and foot is termed as hastapadasana. Stand erect with both feet together, for senior citizen both legs 10 cm apart, hands by the side of the body, relax, and smile. Maintain weight equally on both legs. Join both hands by joining in pranam mudra at the level of lower chest (Anahata Chakra) smile and Chant "Om Mitray Namay". Take a slow deep abdominal breath, hold it, stretch your both arms shoulder trunk, upward, flex the head tuck the chin into the chest, bend forward so that the trunk becomes parallel to the floor, relax the shoulders and upper arms but keep the arms out stretched with elbow extended. Exhale completely, squeeze your abdomen, bend further forward and downward on lower spine, do not bend your knees, and try to touch your fingers to the great toe. Enhance practice gradually; relax your body. Smile, focus your spiritual awareness on Ajna Chakra and physical awareness on lower back spine. Hold the breath in and position to the maximum comfortable duration, give the command all back muscles are getting relaxed and there is no spasm and no pain, enjoy, feel the positivity and increase in the blood flow to the ear and brain along with improvement in hearing. Slowly return to the neutral position in reverse order. Inhale and relax. This aasana improves (Vatadosha) digestion, alleviates flatulence, increases in blood flow to brain and hence improves concentration said to improve hearing and speech discrimination, delays aging, prevents dementia and Alzheimer's disease. By virtue of increase in blood flow adds glow to face prevents wrinkles and hair fall also.

Tratak

Tratak is a Sanskrit word derived from tryatak meaning three: first is practitioner (Yogi), second is object viewed, and third is the process of viewing when all three become one and the practitioner dissolved in; it is called tratak which leads to dhyan, and all chittvratis are eliminated. This state can be termed as state of Samadhi. In this state, scientifically brain is calm, relaxed, and in alpha brain wave state. These alpha waves give a command to body through the hypothalamus to calm down release all feel good hormones and healing takes place. It is a state of one point internal consciousness. Tratak procedure can be divided as Vahya Tratak, Antah Tratak, and Adho Tratak. Vahya Tratak: initially, it can be practiced by focusing the eyes on nail of thumb; later on, it is practiced on a spot called as Bindu Tratak.

Procedure Sit in any comfortable position whether on floor, chair, or margin of bed but be sure that spine is erect, body is comfortable, relaxed, smile on face, close the eyes keep the spine and neck straight take a long deep abdominal breath, hold the breath in, squeeze the whole body, observe squeeze and maintain the squeeze and out breath to comfortable maximum duration, exhale and relax the whole body give a command and make positive effort to relax the mind, open your eyes, extend your left hand at the shoulder level parallel to ground and continuously focus your both eyes on the nail of thumb, do not blink, stare uninterruptedly, till the tears start rolling. Now close the eyes, relax, and repeat the cycle. Just focus the eyes, relax the body and mind. It will lead to introversion. Always do the Tratak by left hand; it activates the right side brain and enhances cognition power.

Dynamic Neurobics

It is an exercise to channelize the subtle energy from Muladhara Chakra onward to Anjana Chakra. Correct technique, posture, frequency of humming focused concentration along with relaxed mind is vital to achieve result.

Technique

Stand erect tall with both feet shoulder distance apart both great toe slightly facing inward, hold your right lobule of ear with left hand by index finger and thumb, facing forward, now hold the left lobule with right hand same way. Squat, go down slowly and inhale simultaneously; your thighs should become just parallel to floor, lean forward with minimum arch, knees in line with the toes. Lift your toes upward and focus your eyes in front, sit on an imaginary low lying chair. Come up slowly in maximum comfortable duration along with an uninterrupted sustained pitch humming (Bhramari), during the whole exercise keep smiling, relax enjoying and keep giving command to brain that I am relaxed, my cognition power and hearing power is increasing. Repeat the squat. Young should face east which radiates predominantly violet pranic energy, activates the Ajna Chakra, pineal gland, while old person should face north which radiate red pranic energy at Muladhara Chakra.

Diet Prevents Aging Deafness

Various studies have demonstrated that dietary vitamin C, vitamin E, and vitamin A has a role in prevention of aging hearing loss [23]. Addition of magnesium, vitamin C betacarotine are associated with better pure tone audiogram and large transiently evoked otoacoustic emission (TEOAE) [24–26]. The transduction current in the hair cells is carried by K^+ ions, generated and managed by stria vascularis hence potassium rich diet may enhance action potential. Supplementation of vitamin D has shown encouraging results [27].

Overnight fasting and caloric restriction has been associated in protecting ageing mitochondrial dysfunction and mitochondrial DNA damage [28]. it also enhances neurogenesis and synaptic plasticity [29]along with reduced atrophy of stria vascularis [30]. The curcumin, has preventive effects on hearing loss induced by repeated noise exposure. And may be good therapeutic choice in preventing sensorineural hearing loss. It is by abolishing intranuclear translocation of nuclear factor-κB-p65 and generation of 4-hydroxynonenal-adducted proteins found in the cochlea after noise exposure [31]

Factors that may increase the risk of oxidative stress, obesity, diet high in fat, sugar and processed food, exposure of radiation (mobile phones), smoking, tobacco products, alcohol consumption, pollution, pesticides industrial chemicals and certain medical drugs [32].

Conclusion

Old age deafness is progressive bilateral, symmetrical sensorineural hearing loss, and usually does not respond to any drug due to progressive loss of hair cells, atrophy of stria vascularis, degeneration of spiral ganglion cells and atrophy of auditory nerve and of cerebral cortex. The basic aetiopathology is inflammatory or autoimmune vasospasm ischemia, infraction and necrosis. We can make an attempt to prevent and revitalize hearing by apoptosis and restoring the blood and oxygen supply by Yoga, meditation and mind full relaxation, generating alpha brain wave, stimulation of non dominant and mid brain activation.

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Compliance with Ethical Standards

Ethical approval This article does not contain any studies with human participants or animals performed by any of the authors.

Conflict of interest The authors declare that they have no conflict of interest.

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