

# Noise in the Ear:

## *What Can Be Done About It?*

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Have you ever experienced a strange ringing sound in your ear that sounded as if a mosquito had gone in? Have you ever wondered what causes the ringing sound, and whether it is a manifestation of something more serious? If you suffer from this ringing sound (called tinnitus), then you should continue reading. In this article, I will explore the common causes of tinnitus, and how you can distinguish the benign causes from the ominous ones.

### **The ear is a noise-producing factory...**

The inner ear converts sound energy in the air to electrical energy so that it can be conducted along the hearing nerve to the brain for reception. This process of energy conversion

is not totally efficient, and will result in the production of by-products. The main by-product is noise that is usually so soft that it cannot be perceived amidst the din of daily living.

However when you go into a very quiet room, you will be able to perceive this by-product noise as a high pitch ringing sound in your ears.

In ears that have degenerated with age or injured by noise, the energy conversion is less efficient. The by-product noise then becomes louder and more perceptible. It may become so loud that it can be heard even as you walk along a busy street.

### **How is Tinnitus Produced?**

There are 3 processes that can result in tinnitus:

- Any form of external or middle ear hearing loss that blocks the perception of environmental noise. The inner ear by-product noises will then appear louder and perceptible.
- Any type of inner ear injury that will cause inefficient conversion of energy. The amount of by-product noise is increased, and can be heard even in the presence of a noisy environment.
- The tinnitus comes from outside the ear. The noise is produced by structures near the ear eg temporomandibular joint (lying just in front of the ear), arteries and veins near the ear, muscle contractions in the head and neck, and turbulent airflow in the nose and upper airways.

## Tinnitus And The Outer Ear

Anything that obstructs the external ear canal like wax, foreign body or tumours will impair the passage of sound energy to the inner ear. Because the inner ear hears less of the environment, the by-product noises from the inner ear will appear louder and becomes perceptible.

Mr Lim visited me in my clinic complaining of right ear tinnitus for 6 months. He has been losing sleep and feeling depressed because of the tinnitus. He also found it difficult to concentrate on his work and to pay attention during night class. He had a habit of drying his ear with a cotton bud after showering. When I examined him, I found a large piece of cotton wool blocking his ear canal. The piece of cotton wool had been resident in his ear canal for 6 months! The tinnitus disappeared instantaneously when the cotton wool was removed from his ear canal.

## Tinnitus, The Middle Ear and its Muscles

If you have lost your hearing because of a broken ear drum or middle ear infection, the by-product noise from the inner ear will appear louder

simply because there is less environmental noise to mask it.

Middle ear infections can also cause tinnitus by producing toxins. These toxins can diffuse into the inner ear to make inner ear function and hearing inefficient. More by-products are then produced and eventually these bring about tinnitus.

There are 2 muscles in the middle ear that will contract when the ear is exposed to loud noises. The contraction will stiffen up the middle ear bones and prevent sound from passing into the inner ear. The contraction of the middle ear muscles act to protect the inner ear from exposure to loud noises.

The middle ear muscles can sometimes go into spasms and incoordinated contractions (called myoclonus). When this happens, you will hear a clicking sound in the ear. Sometimes the clicking sounds can become so loud that a second person can hear it with a stethoscope. The tinnitus is then described as "objective", i.e. it can be perceived and verified by another person.

## Tinnitus And The Inner Ear

Inner ear function will deteriorate with time. Presbycusis (presby

= old, acúsis = hear) causes inefficient hearing. Sound energy from the environment is being transmitted to the inner ear, but the inner ear is unable to fully convert all the energy into electrical energy that the brain can recognise. This results in hearing loss and tinnitus.

Another common cause of inner ear damage is exposure to loud damaging noise. Exposure to excessive noise causes increased wear and tear of the inner ear - akin to jogging on the road without using proper shoes. Over time, the inner ear gets worn out and hears less efficiently. The extra by-products produced result in tinnitus ultimately.

## The Fragility of the Inner Ear

The inner ear is affected by a large variety of lifestyle factors - diet, alcohol, tobacco, caffeine, salt, monosodium glutamate (MSG). Some people are particularly sensitive to salt or MSG. I had a patient who would get severe tinnitus whenever she consumed food that had too much salt or MSG. Smoking can lead to tinnitus by causing a narrowing of the blood vessels that supply the inner ear.

Inner ear damage can also occur in divers who do not

precautions. I saw a diver recently who dived even though she had sinusitis and could not clear her Eustachian tube. During the dive, she cleared her Eustachian tube forcefully. The increased pressure was transmitted to the inner and she suffered an acute bout of vertigo, hearing loss and tinnitus.

There are many diseases that affect the body in general and are not specifically related to the ear. Yet they can give rise to disabling tinnitus. Conditions like anaemia, diabetes, hypertension, high lipids and cholesterol levels, kidney failure and liver problems cause tinnitus by poisoning the inner ear with toxins and depriving it of a healthy blood supply.

Certain drugs like antibiotics, diuretics and pain-killers can also cause tinnitus by modifying the chemistry within the inner ear.

## **The Acoustic (Hearing) Nerve and Its Connections**

Tumours can grow and press on the acoustic nerve, giving rise to hearing loss and tinnitus. The most common type of tumour is acoustic neuroma, which is

one ear. Tinnitus and hearing loss is therefore more ominous if it affects only one side. A person with one-sided hearing loss should have his inner ears imaged with an MRI (magnetic resonance imaging) to exclude or confirm the diagnosis of acoustic neuroma.

## **Objective Tinnitus**

This is tinnitus that is audible to another person using a stethoscope. The noises come from a source external to the ear - arteries, veins, joints, muscles, Eustachian tube and airflow in the nose and upper airways.

When tinnitus coincides with the pulse and heartbeat, it is described as "pulsatile". Pulsatile tinnitus comes from narrowed arteries in the vicinity of the ear. They may also be caused by the presence of a vascular tumour that is richly supplied with blood vessels eg glomus tumour.

During pregnancy, or in people on crash diets (and losing weight rapidly), the Eustachian tube may become wider than usual (patulous Eustachian tube). The noise from turbulent airflow in the nose and upper airways can then be transmitted easily to the ear. This gives rise to tinnitus that coincides with

## **Effects of Stress, Worry and Anxiety**

Most types of tinnitus are not serious or life-threatening. However some people may worry excessively about life-threatening causes, take a pessimistic outlook, and are overly concerned about the worst case scenario. When this happens, the tinnitus becomes a bigger problem than it should be.

Although tinnitus does create some inconvenience, its impact is blown out of proportion if the sufferer worries excessively about it. It is important to manage the fears and anxiety that a tinnitus sufferer experiences. Even if the tinnitus cannot be alleviated, at least its impact on life can be minimised and quality of life enhanced.

## **So Is There A SOLUTION For Tinnitus?**

Effective treatments are available for tinnitus. The treatment has to be customised for each individual because the causes for tinnitus differ from person to person. Treatment can only be prescribed after a process of trouble-shooting to understand

history taking, physical examination, endoscopic examination of the nose and throat, hearing tests, blood tests and imaging studies like CT scans and MRI.



When tinnitus is caused by a broken ear drum or dislocated ear bones, its intensity may be reduced with surgery to repair the ear drum or to set the ear bones in their correct position. If tinnitus is caused by lifestyle indiscretions like smoking or excessive MSG intake, the appropriate lifestyle modifications will lighten the problem.

## **Drug, Vitamins and Herbs for Tinnitus**

Drugs relieve tinnitus by the following mechanisms:

- Improve the circulation, oxygenation and nutrition to the inner ear and brain, eg ginko biloba, betahistine, niacin and carbogen (a mixture of 5% carbon dioxide and 95% oxygen).
- Reduce the swelling of the inner ear that causes recurrent vertigo, hearing loss and tinnitus (Meniere's disease) eg diuretics.
- Stabilise the connections between the inner ear hair cells and the hearing nerves eg caroverine. Caroverine works on a specific type of tinnitus called cochlear-synaptic tinnitus.
- Alleviate the stress and anxiety that comes with each attack of tinnitus, and the worry that it may be a manifestation of a more serious condition eg sedatives, benzodiazepines, tranquillisers.
- Supplement vitamins or minerals that are deficient in the diet eg vitamin B complex, folate, zinc, magnesium.

Chinese physicians have used ginkgo biloba leaves for centuries to treat asthma and bronchitis. Ginkgo has been shown to increase circulation in the body and brain. Most studies showed that between 30-70% of subjects had reduced symptoms over a 6-12 week period. No serious side

effects were observed, and any minor side effects were not statistically significant compared to subjects treated only with placebo.

## **Remedies that reduce Stress**

Certain techniques like biofeedback, acupuncture, massage and aromatherapy may help to alleviate tinnitus by reducing stress and allowing the tense body and mind to relax.

Many people say their tinnitus worsen when they are tired and stressed out from a hard day's work. Getting a good night's sleep and avoiding unnecessary stress will help to improve tinnitus.

Having some soothing background music while sleeping at night will help the mind relax as well as provide background noise to mask out the tinnitus.

## **How to Mask the perception of Tinnitus**

People with tinnitus may benefit from hearing aids to enhance the perception of environmental sounds. The background noise will then suppress and block out the tinnitus.

Masking is the technique of using external sounds to mask the tinnitus and make it less distracting. Masking machines look like hearing aids and come in both in-the-ear and portable models. Many people also find relief from tuning a regular FM radio to an empty frequency and listening to the static. Another popular method is to run an electric fan or to sleep with the bedroom windows open to let the sound of traffic in. If you have an audio CD player, consider putting on a CD with the sounds of nature (ocean, jungle, whales, etc) or light music before going to bed.

## Can Tinnitus be Prevented?

The most common cause of tinnitus is over-exposure to excessively loud noise. As exposure to loud noise is usually avoidable, most cases of tinnitus are therefore preventable. Avoid these noisy situations, or use hearing protection to reduce its damaging effects. Rock concerts, movie theatres, nightclubs, construction sites, guns, power tools, stereo headphones and musical instruments are just some of the things that can be hazardous to your ears.

If you experience temporary ringing sounds in your ears

after being exposed to loud noise, you are at risk of suffering from hearing loss and permanent tinnitus. If the tinnitus is causing you to worry that you might be suffering from a brain tumour, get your doctor to evaluate the problem for you. If the tinnitus is affecting your quality of life and ability to perform and concentrate, your doctor may design a treatment strategy to reduce the impact of the tinnitus. No matter what the cause of tinnitus is, many tools are available that will help you manage and cope with the problem.

## The Ten steps to Tinnitus Relief

Here are some techniques that will help you gain control of your tinnitus problem:

1. *Get enough sleep and rest. Avoid overfatigue.*
2. *Avoid the use of nerve stimulants eg coffee (caffeine) and smoking (nicotine).*
3. *Accept the tinnitus as an annoying reality, and learn to ignore it as much as possible.*
4. *Know that tinnitus will not cause you to go deaf, lose your mind, or cause death, so learn to dispel such distracting and terrifying thoughts.*
5. *Tinnitus is more disturbing at bedtime*

*surroundings. Any noise in the room, such as the nearby sounds of traffic, or a CD of soothing music, will mask and cover up the irritating tinnitus and make them less annoying.*

6. *If you have significant hearing loss, a hearing aid can reduce your tinnitus by amplifying environmental sounds and masking the tinnitus.*
7. *A masking device may help reduce tinnitus by introducing external sounds. Some patients obtain relief only when the device is worn, while others find that tinnitus is reduced for hours even after the device has been removed.*
8. *Some patients become depressed when they are unable to cope with their tinnitus. These patients will be referred for therapy or anti-depressant treatment.*
9. *Stress and anxiety can increase the distress caused by tinnitus. Patients can benefit from biofeedback, acupuncture, massage, aromatherapy and stress management training.*
10. *Tinnitus is made worse by jaw (temporomandibular) or neck musculoskeletal disorders. In these cases, dental treatment or physical therapy may be*