

Michigan Ear Institute

# Head Noise or Tinnitus



[www.michiganear.com](http://www.michiganear.com)

## WELCOME

*Welcome to the Michigan Ear Institute, one of the nation's leading surgical groups specializing in hearing, balance and facial nerve disorders. The Michigan Ear Institute is committed to providing you with the highest quality diagnostic and surgical treatment possible.*

*Our highly experienced team of physicians, audiologists and clinical physiologists have established international reputations for their innovative diagnostic and surgical capabilities, and our modern, attractive facility has been designed with patient care and convenience as the foremost criteria.*

*It is our privilege to be able to provide care for your medical problems and we will strive to make your visit to the Michigan Ear Institute a positive and rewarding experience.*

Head noise, or tinnitus, is common. It may be intermittent or constant, mild or severe, and vary from a low pitched roar to a high pitched type of sound like a whistle. It may be subjective (audible only to the patient) or objective (audible to others). It may or may not be associated with hearing impairment.

Tinnitus is usually thought of as a symptom and not a disease. Just as pain in the arm or leg is a symptom and not a disease. Because the function of the auditory (hearing) nerve is to carry sound, when it is irritated from any cause, the brain interprets this impulse as noise. This phenomenon is similar to the sensation nerves elsewhere. A similar situation can occur in a patient who has pain from neuralgia. Their feeling of pain occurs because of irritation of the nerve and not because there is a problem where the nerve originates.

Tinnitus may or may not be accompanied by a hearing impairment. Hearing is measured in decibels (dB). A hearing level of 0 to 25 dB is considered normal for conversational speech.

## HEARING MECHANISM

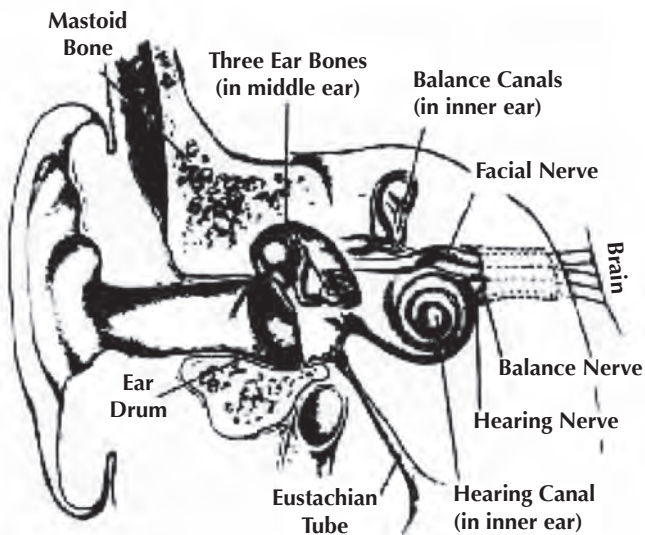
In order to understand the possible causes of tinnitus, one must have some knowledge of the hearing mechanism. The mechanism is made up of five main divisions: the external ear, the middle ear, the inner ear, the nerve pathways and the brain.

Right Ear \_\_\_\_\_ Decibels

Left Ear \_\_\_\_\_ Decibels

Conversion to degree of handicap

25 dB	0%	55 dB (Moderate)	45%
30 dB (Mild)	8%	65 dB (Severe)	60%
35 dB (Mild)	15%	75 dB (Severe)	75%
45 dB (Moderate)	30%	85 dB (Severe)	90%



## External Ear

The external ear consists of visible portion of the ear (auricle) and the external ear canal. These structures collect sound waves and transmit them to the eardrum.

## Middle Ear

The middle ear lies between the eardrum and the inner ear. This air filled space contains three ossicles: the malleus, the incus and the stapes (hammer, anvil and stirrup). Vibrations of the eardrum are transmitted across the middle ear space by these three small bones. Movement of the stapes results in fluid waves in the inner ear.

The middle ear chamber is lined by a membrane similar to the lining of the nose and contains secretory glands and blood vessels. This chamber is connected to the back of the nose by a narrow channel called the eustachian tube.

The eustachian tube is usually closed but opens occasionally to maintain equal pressure between the middle ear chamber and the outside atmosphere, as evidenced by the popping sensation noted in the ear during altitude changes.

## **Inner Ear**

The inner ear is a fluid filled chamber enclosed in dense bone. It contains the tiny hearing cells and is lined by a delicate transparent membrane supplied by microscopic blood vessels. In the small chamber, fluid waves, resulting from movement of the stapes, are transformed into electrical impulses in the nerve.

## **Nerve Pathways**

The electrical impulses created in the inner ear chamber are transmitted to the brain by the hearing nerve. The nerve pathways leading to the brain are enclosed in a small bony canal along with the nerve of balance and the nerve which stimulates movement of the facial muscle.

## **Brain**

The hearing nerve pathways divide, as they reach the brain, into an inter-communicating system far more complex than the most extensive telephone exchange. Nerve impulses are then transformed into recognizable sound.

## **Tinnitus**

Most tinnitus is audible only to the patient; this is called subjective tinnitus. Tinnitus audible to both the patient and others is called objective.

Objective tinnitus may be due to muscle spasms in the middle ear or eustachian tube, or be due to abnormalities in the blood vessels surrounding the ear.

## **Muscular Tinnitus**

Tinnitus may result from spasm of the two muscles attached to the hearing bones or from spasm of muscles attached to the eustachian tube, the channel which connects the middle ear to the back of the nose.

There are two muscles in the middle ear: the stapedius, attached to the stapes bone (stirrup) and the tensor tympani, attached to the malleus bone

(hammer). These muscles normally contract briefly in response to very loud noise.

On occasions one or both of these muscles may begin to contract rhythmically for no apparent reason, for brief periods of time. Because the muscles are attached to one of the middle ear (hearing) bones these contractions may result in a repetitious sound in the ear. The clicking, although annoying, is harmless and usually subsides without treatment.

Should the muscle spasm continue, medical treatment (muscle relaxants) or surgery (cutting the spastic muscle) may be necessary.

Muscular tinnitus resulting from spasm from one of the various muscles of the throat attached to the eustachian tube is uncommon, but can also result in episodes of rhythmic clicking in the ear. This is called palatal myoclonus and usually responds to muscle relaxants.

## **Vascular Tinnitus**

There are two large blood vessels intimately associated with the middle and inner ear; the jugular vein and the carotid artery. These are the major blood vessels supplying the brain.

It is not uncommon to hear one's heart beat or to hear the blood circulating through these large vessels. This may be heard when an individual has a fever, a middle ear infection, or is engaging in strenuous exercise. The circulation sound in these instances is temporary and is not audible to others.

On occasions the sound of blood circulation will become audible to others. This can be due to thickening of the blood vessel wall (a normal occurrence as one grows older), a kink in the vessel or an abnormal growth on the vessel wall. This pulsing sound can also be due to increased spinal fluid pressure. Further testing may be necessary to determine the cause and treatment indicated in these uncommon cases.

## **External Ear Tinnitus**

Obstruction of the external ear canal by wax, foreign bodies or swelling may produce a hearing impairment or pressure on the eardrum. This frequently results in a pulsating type of tinnitus.

## **Middle Ear Tinnitus**

Disturbance of function of the middle ear may result from allergy, infection, injury, scar tissue or impaired motion of the three middle ear bones. These disturbances often result in hearing impairment and may lead to head noise. But there is no relationship between the degree of hearing loss and the intensity of the tinnitus

## **Inner Ear Tinnitus**

Any condition which disturbs the inner ear chamber may produce head noise. This may be due to infection, allergy, or circulatory disturbances which produce changes not only in the fluid but also in the encasing membranes of the inner ear.

## **Nerve Pathway Tinnitus**

The nerve pathways are the most delicate structures of the hearing mechanism. The small hair cells which serve to transform fluid waves into nerve impulses are analogous to the cells of the eye retina which transforms light waves into nerve impulses. The slightest swelling or interference with these delicate cells from any cause readily produces impairment of function and irritation. This may occur from a variety of causes: infection; allergic swelling; systemic diseases, either acute or chronic, with resultant toxic effects; sudden exposure to high noise levels in susceptible persons; certain drugs to which the patient may be sensitive; minute changes in the blood supply and changes in nutrition.

Pressure changes may produce swelling both from outside and within the nerve as it transverses the

bony tunnel through which it passes to the brain. In these instances, the tinnitus occurs on one side of the head. The balance and facial nerves pass through this bony tunnel and can also be affected by the pressure.

Rupture or spasm of one of the small blood vessels occurring anywhere in the auditory pathway produces pressure and interference with circulation. Consequently, sudden tinnitus, with or without partial or total loss of hearing function, may occur. If the blood clot is small it may absorb with little or no permanent changes. This condition, like the pressure phenomenon, occurs only on one side and because it has occurred once does not mean it would necessarily occur again either on the same or opposite side.

## **Brain Tinnitus**

Any disturbance, whether due to swelling or pressure or interference with circulation, may occasionally involve one or more of the complex hearing pathways as they enter and terminate in the brain. In most of these instances the symptoms are localized to one ear, the other symptoms and signs develop which aid the doctor in determining the cause and location of the disturbance.

## **HEARING IMPAIRMENT**

Head noise or tinnitus may or may not be associated with hearing impairment. After reviewing the many causes of this symptom it is easy to understand why the hearing may at times be affected when tinnitus is present. If a hearing loss co-exists with tinnitus, the severity of the head noise is not an index as to the future course of the hearing impairment. Many persons with tinnitus have the erroneous fear they are going to lose their hearing. This is an unnecessary fear.



## TREATMENT

If the examination reveals a local or general cause of the hear noise, correction of the problem may alleviate the tinnitus. In most cases, however, there is no medical or surgical treatment which will eliminate tinnitus.

### General Measures

- 1 Make every effort to avoid nervous anxiety, for this only stimulates an already tense auditory system.
- 2 Make every attempt to obtain adequate rest and avoid over fatigue.
- 3 The use of nerve stimulus is to be avoided. Therefore excessive amounts of coffee (caffeine) and smoking (nicotine) should be avoided.
- 4 Try to accept the existence of the head noise as an annoying reality and them promptly and completely ignore it as much as possible.
- 5 Tinnitus will not cause you to go deaf, will not result in your losing your mind or cause death, so immediately forget such distracting and terrifying thoughts.
- 6 Tinnitus is usually more marked after one goes to bed and his surroundings become quiet. Any noise in the room, such as a loud ticking clock or radio, will serve to mask the irritating head noise and make them much less noticeable.
- 7 If one sleeps in an elevated position with one or two pillows, less congestion to the head will result and the tinnitus may be less noticeable.
- 8 Sedatives of various types may be used occasionally for temporary relief.

## **Biofeedback Training**

Biofeedback training is effective in reducing the intensity of tinnitus in some patients. Treatment consists of biofeedback exercises, in hourly sessions, in which the patient learns to control circulation to various parts of the body and relax muscles attached to the head. When a patient is able to accomplish this type of relaxation tinnitus often subsides.

Biofeedback exercises are not for all patients with tinnitus. Results of treatment have been good, however, in those individuals whose tinnitus is severe and interfering with daily activities or with sleep.

## **Tinnitus Masking**

Tinnitus masking is based on the principle that an external noise can reduce or “drown out” the internal tinnitus. Sometimes common items such as radios or fans can be successful. Environmental sounds such as ocean waves or rainfall can be created by sound generators available at many stores. Specialized sound generators are available that create specific tones based on an individuals’ tinnitus.

## **Tinnitus Adaptation**

Most of those affected by tinnitus will adapt over time and be much less aware of the sound. Specific techniques such as tinnitus retraining therapy are available to promote changes in perception over time. They can be very successful.

## **Medications**

A variety of medications are available to treat tinnitus. Although none of these are true cures they can be beneficial in various situations. Some of the medications have direct effects on the tinnitus and some have indirect effects such as controlling frustration or sleep disruption associated with the tinnitus.

## SUMMARY

The auditory (hearing) pathway is one of the most delicate and sensitive mechanisms of the human body. Since it is directly associated with the general nervous system, its responses are in direct proportion to the anxiety of the person involved.

In order for any treatment of tinnitus or head noise to be successful, it is imperative that the patient have a thorough understanding of this distressing symptom complex.

**Michigan Ear Institute**



## Head Noise or Tinnitus

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Received by

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Patient Signature

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Date

For more information on the services and staff of the Michigan Ear Institute, call us at (248) 865-4444 or visit our web site at [www.michiganear.com](http://www.michiganear.com)

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