



HEARING IMPAIRMENT DUE TO STENOSIS OF CAROTID ARTERY.

<https://doi.org/10.5281/zenodo.13844657>

Shodmonkulova Gulrukh Rustam kizi

Abstract

The review article presents the results of the study of the problem of hearing impairment or tinnitus is a pathology that is often encountered in the practice of doctors of various specialties. The prevalence of tinnitus varies widely, and is found not only in adults, but also in children. Tinnitus can be caused not only by problems with the peripheral part of the auditory analyzer, but also by other diseases, including pathology of the vascular, nervous, muscular and musculoskeletal systems.

Key words

Carotid, tinnitus, symptom, symptom, asymptomatic, general neurological symptoms.

Introduction. Carotid artery stenosis is a narrowing of the artery that can lead to impaired blood supply to the brain and, as a consequence, cause various neurological symptoms . Diseases of the carotid arteries can lead to many extracranial manifestations. Tinnitus is a recognized symptom and has long been correlated with significant stenosis of the internal carotid artery. It has been largely classified into pulsatile and non-pulsatile types with different treatment approaches and prognoses. A competent approach to the diagnosis, assessment and treatment of tinnitus can improve rehabilitation, adaptation and quality of life of this category of patients.

Hearing impairment is a major multidisciplinary clinical problem, especially in older patients. It affects about 30% of people over 65 years of age and 50% of people over 80 years of age. This disease has various causes, linking the areas of knowledge of many medical specialties Otolaryngology and neurology, which are mainly concerned with the diagnosis and treatment of this disease. Diagnosis and treatment of patients with hearing impairment requires extensive knowledge, experience and multidisciplinary diagnostics. [1]

Carotid artery stenosis may be asymptomatic or may present with general neurological symptoms such as motor, sensory, visual or speech impairments [2] However, we usually encounter very discrete, non-specific symptoms of ischemia, such as headaches, dizziness, tinnitus and hearing loss. [3] Statistics do not know the exact number of people with carotid artery stenosis. It is only known that at the



beginning of the 21st century, there were 12 million patients in Europe who needed help because of this pathology. Let's consider the causes and symptoms of the problem, and tell you about the methods of treating carotid stenosis.

Clinical classification is based on the degree of narrowing:

Minor stenosis – the lumen is completely passable or narrowed to 29%.

Moderate – overlap from 30% to 49%.

Pronounced when the narrowing is from 50% to 69%.

Critical stenosis 70% - 99%.

Occlusion. Complete cessation of blood flow in a separate section of a vessel.

Thus, today the standard diagnostic tool for determining this is the widely available duplex ultrasonography .

The arteries of the human body have different diameters. The aorta and main vessels are wide, peripheral arterioles are noticeably narrower. The lumen of the terminal branches reaches several millimeters . Narrowing of the vessel means that the organ it feeds begins to "starve", does not receive enough nutrients and oxygen, and its functionality is impaired. Unfortunately, very often this organ is the brain.

The pathophysiological mechanism of hearing impairment is still poorly understood. There are several theories describing the origin of tinnitus. According to one of the main concepts, the primary source of tinnitus may be disturbances in the cochlea, but the subsequent chain of neural changes in the auditory cortex of the brain plays a major role in the consolidation of the symptom.

Another theory, known as the dorsal cochlear nucleus hypothesis, tinnitus occurs due to a decrease in auditory nerve input and disinhibition of the cochlear nucleus, followed by an increase in spontaneous activity in the central auditory cortex.

Several studies have also suggested that the reorganization of central nervous system pathways that occurs in tinnitus is similar to the processes observed in neuropathic pain.

Tinnitus is classified according to different characteristics. According to sound characteristics, there are tonal and non-tonal tinnitus . Tonal tinnitus is a continuous noise (hum, ringing, whistling) of one frequency, non-tonal tinnitus is periodically occurring sounds in the form of clicks, crackles and other unpleasant auditory sensations. Depending on the cause of occurrence, the following types of tinnitus are distinguished :

Subjective noise is sounds that are only audible to the patient. In about 50% of cases, subjective Tinnitus is caused by damage to the central parts of the auditory analyzer, but can also occur with other pathologies, such as cardiovascular and endocrine diseases.



Objective noise is sounds that a doctor can hear when examining a patient. Objective tinnitus is much less common than subjective noise and can be caused by neuromuscular factors (myoclonus of the muscles of the middle ear and soft palate, spontaneous otoacoustic emission), muscle-joint disorders (pathologies of the temporomandibular joint, malocclusion), angiogenic factors (stenosis of arteries, venous noises, heart and vascular defects).

Neurological noise is an auditory sensation caused by damage to the peripheral nerve receptors in the inner ear. For example, neurological tinnitus occurs in patients with Meniere's disease, a non-inflammatory inner ear disease that, in addition to tinnitus, is accompanied by attacks of labyrinthine vertigo and progressive hearing loss.

Somatic noise is tinnitus caused by damage to any organ, pathological impulses of which irritate the auditory analyzer. In some patients, somatic in the ears can be provoked by touching or movements.

The famous otolaryngologist, Professor Igor Borisovich Soldatov, developed a classification of tinnitus to assess discomfort in the ears, in which he identified the following degrees:

I - tinnitus is tolerated by the patient calmly and does not affect the general condition;

II degree - unpleasant auditory sensations irritate in silence, at night, interfere with sleep;

III degree - noise is constantly disturbing, disrupts sleep and worsens mood;

IV - sounds become unbearable, deprive you of sleep and reduce your ability to work.

Another classification based on the patient's subjective sensations was proposed by A. P. Velitsky . In it, he identified 3 degrees of tinnitus :

I - the patient does not actively complain about noise, noting its presence only during questioning;

II - the patient complains of tinnitus, but considers it a secondary problem;

III - tinnitus is the patient's leading complaint.

It is important to note that tinnitus should be distinguished from auditory hallucinations. In some cases, patients who come to see an otolaryngologist complaining of tinnitus describe their sensations as singing or music. In these cases, we are most likely talking about auditory hallucinations - the perception of an object that is absent in reality, including one that does not exist in nature at all, which never occurs in healthy people (in the absence of hypnosis, psychotropic or narcotic drugs).

An electronic search was conducted across a number of databases including PubMed , Scopus , Google scholar with no date restrictions. Search terms included:



tinnitus, hearing impairment in carotid artery stenosis, carotid artery disease and stenosis, lesion size, location, prevalence and natural history, risk factors, survival rates, medical therapy, surgery, and mortality. Search terms were matched with MeSH terms used as keywords. Articles were selected based on their title and abstract. Reference lists of these selected articles were also reviewed to identify any relevant articles that might be suitable for inclusion in this study

To date, there is no prevailing consensus that is sufficient to best describe the natural history of this disease, and the current literature lacks detailed information on the prevalence and characteristics of this condition. Therefore, reliable studies are needed on the pathophysiological factors, etiologic mechanisms, and pathogenesis of tinnitus in correlation with carotid disease factors such as location, lesion size, and degree of stenosis of the affected vessels, among others.

Historically, carotid atherosclerosis has been considered the main arterial cause of tinnitus. However, arterial stiffness has also emerged as an important parameter that can predict carotid events and may be associated with stroke incidence Huang YS, Koo M, Chen JC, Hwang JH. The association between tinnitus and the risk of ischemic cerebrovascular disease in young and middle-aged patients: a secondary case-control analysis of a nationwide, population-based health claims database [4] A 1 meter per second increase in aortic pulse wave velocity correlates with a 14% increase in cardiovascular events and a 15% increase in mortality, adjusting for age, sex, and risk factors.

Microcirculation in the cochlea may be compromised by this increased arterial stiffness due to the terminal nature of this circulation. However, this emerging evidence has not provided any compelling pathophysiological evidence as to how this relates to pulsatile tinnitus. It has been shown that increased arterial stiffness can lead to microvascular damage in the brain, and this can manifest itself in a variety of clinical symptoms and signs, including tinnitus [5] This led to another entity related to arterial stiffness of the carotid system, involved in the development and severity of "idiopathic subjective tinnitus" [6].

Without scientifically valid and clinically valid evidence, it is difficult to understand how such a hypothesis can determine the correlation between carotid artery disease and tinnitus based on this specific evidence, and further research and investigation are needed to accept or refute this. In addition, attempts have been made to define another target for tinnitus and its correlation with carotid artery disease. The size of the lesion or the location of the carotid artery disease and the ability to combine these factors with arterial stiffness (using methods such as carotid and femoral pulse wave velocity) and comparisons of local stiffness measurements (performed using Doppler ultrasonography) have achieved



conceptual precision in describing a meaningful mechanism with precise values for the occurrence of tinnitus.

Conclusion. Carotid artery stenosis accounts for approximately 11.76% of pulsatile tinnitus cases. Patients, and this should be taken into account when examining patients, especially those with atherosclerotic risk factors and in the elderly. Since pulsatile tinnitus may be the first and only manifestation of severe carotid stenosis, it should immediately cause a color change. Ultrasonographic Doppler examination in patients with cardiovascular risk factors.

REFERENCES

1. [Hannaford PC, Simpson JA, Bisset AF, i wsp The prevalence of ear, nose and throat problems in the community: results from a national cross-sectional postal survey in Scotland. *Fam Pract* . 2005 ;22:227 -233. [PubMed] [Google Scholar]].
2. [Terzi S, Arslanoglu S, Demirai U, Eren E, Kankuri O. Carotid Doppler Ultrasound Evaluation in Patients with Pulsatile Tinnitus *Indian J Otolaryngol Head Neck Surg* . 2015; 67(1):43-47. [PMC free article] [PubMed] [Google Scholar]
3. Seemungal BM. Neuro-otological emergencies. *Curr Opin Neurol* . 2007;20(1):32-39. [PubMed] [Google Scholar] Carotid artery stenosis should be considered in patients with hearing loss. Dorobisz K, Dorobisz T, Janczak D, Krecicki T.
4. . *PLoS One* 2017;12:e0187474.
5. Mustapha M, Nassir CMNCM, Aminuddin N, Safri AA, Ghazali MM. Cerebral small vessel disease (CSVD) - lessons from the animal models. *Front Physiol* 2019;10:1317.
6. Bayraktar C, Taşolar S. Relationship between increased carotid artery stiffness and idiopathic subjective tinnitus. *Eur Arch Otorhinolaryngol* 2017;274:2125-30.