

Manifestations of Migraine in Otolaryngology: Traditional Review

Migrenin Kulak Burun Boğazdaki Belirtileri: Geleneksel Derleme

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ABSTRACT Migraines are recurring headaches that frequently occur with nausea and sensitivity to light. They can be easily diagnosed because they occur with headaches of varying severity and periods when the patient experiences no symptoms. It is stated that headaches are usually throbbing and relieved after sleeping. Rhinosinusitis-related headaches, the most frequently encountered by ear, nose, and throat (ENT) physicians, are generally more disturbing in the mornings due to stasis and being in a horizontal position at night. It is generally accepted that the leading cause of migraines is neuroinflammation of the trigemino-vascular system. The trigemino-vascular system contains peripheral trigeminal nerve endings that innervate the pia mater, dura mater, and cranial blood vessels, among other structures. Patients with suspected migraine may also present primarily with vestibular symptoms. It is expected to have an aura before attacks. However, at the first presentation, patients may also describe migraine without aura or migraine headache accompanied by photophobia and phonophobia. Given the enigmatic origins of both tinnitus and migraines, it is plausible that they have a common pathophysiology connected to the central nervous system. In particular, migraine-related tinnitus is caused by trigeminal nerve activation and is likely hypersensitivity of the cerebral cortex. Some symptoms that may be noticed include vertigo, tinnitus, impaired hearing, ataxia, and issues with vision in both eyes. With a comprehensive literature analysis, this study discusses the otolaryngologic features of migraines to update the general information, especially that of ENT specialists.

Keywords: Migraine; headache; vertigo; tinnitus; trigeminal nerve stimulation

ÖZET Migren, değişen şiddette ve sıklıkla mide bulantısı ve ışığa duyarlılıkla birlikte ortaya çıkan tekrarlayan baş ağrılarıdır. Genellikle zonklayıcı tarzda olduğu ve uyuduktan sonra hafiflediği belirtilmektedir. Kulak-burun-boğaz (KBB) hekimlerinin en sık karşılaştığı rinosinüzite bağlı baş ağrıları ise genellikle gece yatay durumda olmaya bağlı sinüs içinde staz nedeniyle sabahları daha rahatsız edici olmaktadır. Genel olarak migrenlerin temel nedeninin trigemino-vasküler sistemin nöroinflamasyonu olduğu kabul edilmektedir. Trigemino-vasküler sistemin diğer yapıları arasında pia mater, dura mater ve kranial kan damarlarını innerve eden periferik trigeminal sinir uçlarını içerdiği bilinmektedir. Migren şüphesi olan hastalar, öncelikle vestibüler semptomlarla da başvurabilirler. Ataklar öncesinde aura olması yaygındır. Ancak hastalar ilk başvuruda, aurasız migren ya da fotofobi ile fonofobinin eşlik ettiği migren baş ağrısı da tanımlayabilirler. Tinnitus ve migrenlerin etiyolojik nedenleri hâlen netleşmemiş olduğundan, santal sinir sistemine ait bir nedenle tinnitus ve baş ağrısı semptomları birlikte yaşanabilir. Trigeminal sinir stimülasyonu ve muhtemelen merkezi hipersensitivite nedeniyle migren ile tinnitus etiyolojisinin bağlantılı olabileceği de teoriler arasındadır. Birlikte görülebilecek semptomlar arasında baş dönmesi, tinnitus, işitme kaybı, ataksi ve her iki gözün her iki yarı alanında görme problemleri yer alabilir. Bu makalede, migrenin KBB alanındaki belirtileri detaylı bir literatür taramasıyla sunulmaktadır. Amacımız, KBB hekimlerinin bu konudaki bilgilerini güncellemektir.

Anahtar Kelimeler: Migren; baş ağrısı; baş dönmesi; tinnitus; trigeminal sinir stimülasyonu

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Migraines are recurring headaches that frequently occur with nausea and sensitivity to light. They can be easily diagnosed because they occur with headaches of varying severity and in episodes. They may manifest themselves before the commencement of a headache, while it is in progress, or frequently during a period in which the headache is absent. Because of this, the majority of people who suffer from migraines report experiencing vertigo or dizziness as the primary symptom rather than headaches of any kind. Due to this particular case, the focus of this article is on providing a description of vertigo that is related to migraine.¹⁻³

The clinical relationship between migraines and dizziness has been the subject of several references since the 19th century. Several syndromes of episodic vertigo that are related to migraines have been documented over time.^{4,5} The benign paroxysmal vertigo that affects children and the benign recurring vertigo that affects adults are examples of these illnesses.^{5,6} Several authors have even raised the possibility that migraines and Ménière disease are related.

Vertigo is another symptom of basilar migraine, a type of migraine that is also known as Bickerstaff syndrome and was once known as basilar artery migraine.⁷

VERTIGO AND MIGRAINES: DEFINITIONS

Headaches that are repeated and are commonly accompanied by nausea and sensitivity to light are known as migraine headaches. Migraine headaches can be distinguished from other headaches because the patient does not experience any symptoms during the intervals between attacks. The throbbing sensation associated with headaches is somewhat familiar, and it is usual for the headaches to be reduced after resting. Additionally, the headaches may be accompanied by visual issues, vertigo, or dizziness during the condition. One of the most common causes of migraines in the patient's family is a history of migraines.

The illness commonly referred to as migraine can be divided into two distinct categories: migraine without aura, which accounts for ninety percent of all migraine headaches, and migraine with aura, which

accounts for ten percent of all cases of migraine headaches. Vertigo is characterized by the patient's impression of movement in the surrounding environment or the patient's perception of movement in the surrounding environment overall.¹

MIGRAINE CLASSIFICATION ACCORDING TO THE INTERNATIONAL HEADACHE SOCIETY

According to the International Headache Society (IHS), there are several types of migraines, including infancy period syndromes, migrainous infarction, and migraines with or without aura, respectively.⁸

MIGRAINE WITHOUT AURA

Migraine without aura, often known as common migraine, is characterized by the presence of at least two of the following criteria. Common migraine is an informal term:⁸

There is evidence of every one of the following characters:

- Anxiety that is brought on by climbing stairs or other similar actions that are believed to be ordinary
- A unilateral posture
- A pulsating quality
- A moderate to severe severity that limits or prevents your ability to carry out normal activities

If the headache is not addressed, it can last anywhere from four to seventy-two hours; in children younger than fifteen, it can last anywhere from two to forty-eight hours. At least one of the following symptoms manifests itself during the headache:

1. Nausea in combination with or without vomiting;
2. Photophobia in combination with or without phonophobia; or
3. A combination of the two.

It is observed that at least one of the following takes place throughout the clinical evaluation:⁸

- The patient's medical history and the results of the physical examination do not point to the presence of any other disorder

■ The findings of the history and physical examination do point to the presence of another condition; nevertheless, according to the proper investigations [such as magnetic resonance imaging or computed tomography (CT) scanning of the head], the other disorder is removed from consideration.

MIGRAINE WITH AURA

In the past, migraine with aura, sometimes referred to as classic migraine, was classified based on the characteristics of the headache and the aura. The headache symptoms are identical to those described above for migraines that do not involve an aura. The aura is distinguished by the presence of at least two encounters with the following:⁸

■ A single reversible aura symptom that indicates a disturbance in the focal central nervous system (CNS), such as “vertigo, tinnitus, impaired hearing, ataxia, visual symptoms in one hemifield of both eyes, dysarthria, double vision, paresthesias, paresis, and a decreased level of consciousness.”

■ An aura symptom that manifests itself gradually over more than four minutes or two or more symptoms that immediately follow one another

■ No aura symptom lasts more than sixty minutes unless more than one aura symptom is present.

■ Headaches that occur before, during, or up to sixty minutes after the aura has been completed.

Therefore, to meet the requirements for migraine with aura, it is necessary to have a migraine that is accompanied by a lengthy aura. However, the aura must continue for a period longer than sixty minutes but less than seven days.¹

Basilar migraines are distinguished from other types of migraines by the presence of two or more aura symptoms.^{1,8} They are defined by those who fit the criteria for migraines with aura.

A number of symptoms may be encountered, including vertigo, tinnitus, impaired hearing, ataxia, and visual abnormalities in both hemifields of both eyes. A few of these symptoms are listed below.

Some of the symptoms that may be present include dysarthria, double vision, bilateral paresthesias, bilateral paresis, and a diminished degree of con-

sciousness. Others include bilateral paresis and bilateral paresthesias.

It is possible to have migraine aura without headache, which is a replacement for migraine equivalent or acephalic migraine. This condition meets the requirements for migraine with aura. However, it does not involve headache.¹

SYNDROMES THAT OCCUR DURING CHILDHOOD

Periodic syndromes in children may be antecedents to migraines or be connected with migraines that occur in childhood.¹

Childhood benign paroxysmal vertigo is relatively uncommon and characterized by brief random bouts of dysequilibrium, anxiety, and frequent nystagmus or vomiting. Both the electroencephalogram and the neurologic examination are described as normal.¹

MIGRAINOUS INFARCTION

Patients who have recently been diagnosed with migrainous infarction, which is a replacement for complex migraine, have previously met the criteria for migraine with aura. However, neurologic impairments are not reversible after seven days, and neuroimaging indicates ischemia infarction in the relevant area. Their current attack is characteristic of attacks that have occurred in the past. Investigations that are appropriate lead to the elimination of other potential causes of infarction.¹

SYMPTOMS OF MIGRAINE IN OTOLARYNGOLOGY

VESTIBULAR MIGRAINE

The general prevalence of vertigo in the United States is estimated at 2.7%, which may be the most common cause of vertigo episodes in adults.⁹⁻¹¹ Underdiagnosis is quite widespread. Even though a physician evaluated two-thirds of patients with vestibular migraine (VM), only twenty percent were identified with VM, according to a study that assessed the prevalence of VM.¹² Compared to men, the number of women impacted is three to one.¹³

The Barany Society offers diagnostic criteria for both probable VM and VM, with the latter addition being included in the appendix of the International Criteria for Headache Disorders (ICHD-3).¹⁴ The Barany Society continues to publish its diagnostic criteria. These requirements are listed on their website for your perusal. Patients who are suspected of having migraines exhibit vestibular symptoms and have a history of migraines, either with or without aura or migrainous symptoms. Patients who have a history of migraines are thought to have symptoms such as “photophobia, phonophobia, migraine headache” during attacks. Patients who have been diagnosed with migraines, on the other hand, have experienced both types of symptoms. However, a recent investigation demonstrated that a significant number of patients who experienced vertigo and migrainous symptoms did not fulfill the ICHD criteria for vertigo myocardial infarction.¹⁵ This was most likely due to diagnostic criteria rather than fundamental characteristics of the vertigo myocardial infarction cohort.

Vertigo, postural imbalance, head motion-induced dizziness, and visually-induced vertigo are examples of vestibular symptoms that need to be considered to arrive at a diagnosis. Among the vestibular symptoms that are most commonly connected with the illness, spontaneous rotational vertigo is the one that is associated with an estimated prevalence of 67% in the population.¹² According to data that was not published, the most prevalent causes of vertigo in a sample of 54 patients from the senior author’s institution were motion (83 percent), stress (76 percent), busy visual sceneries (72 percent), scrolling on a screen (67 percent), and impaired sleep (61 percent). These were the factors that were most frequently cited. It was stated by 63% of the participants in that group that they had experienced ear pressure associated with VM manifestations. In addition, people who have a history of difficulties with their vocal cords are at a greater risk of acquiring cochlear abnormalities. These abnormalities include tinnitus, sudden deafness, and sensorineural hearing loss (HL). The likelihood of having these disorders increases by around three times.¹⁶ Noteworthy is the fact that nearly half of the patients who suffer from Ménière’s illness also have a history of migraines. This is an in-

triguing fact to take into consideration. It appears that migraines are a potential contributor to the development of Ménière’s illness.^{17,18} A correlation exists between migraine history and tinnitus, HL, and auditory fullness in patients.

PATHOGENESIS

Although several theories have been proposed, the exact cause of vestibular dysfunction (VM) remains a mystery. Factors believed to contribute to these hypotheses include the vestibular system, sensory hypersensitivity, abnormal multisensory processing, the impact of calcitonin gene-related peptide (CGRP), and trigemino-vascular illness.⁹

The system of trigemino-vascular is believed to be the site of neuroinflammation that begins migraines. The trigemino-vascular system comprises peripheral trigeminal nerve terminals that supply nerve impulses to various structures, such as the pia, dura mater, and blood vessels within the skull. The trigeminal nerve not only transmits pain signals to the front two-thirds of the head, but it also produces neuropeptides such as CGRP, substance P, neurokinin A, and nitrous oxide. Muscle cell degranulation, neurogenic inflammation, and vasodilation are potential complications of this technique.¹⁹ Researchers have looked at the role of the neuropeptide CGRP in the development of VM. Organs responsible for processing hair cells, such as the cochlea, semicircular canal, and lateral line, all use this protein in their efferent synapses. Researchers have found that transgenic mice lacking CGRP had impaired suprathreshold cochlear nerve activity and delayed “vestibular-ocular reflex” development. Mice deficient in CGRP may have trouble maintaining their balance and may have impaired otolith activity.²⁰

Migraine runs in families for many VM patients, although little is known about the exact genetic defects that cause this condition. Inheritance by autosomal-dominant gene inheritance has been seen in the past.¹² Conversely, not all genetic loci have been given the green light for use in VM. New evidence suggests that a mutation in the transient receptor potential channel-a cation channel involved in regulating pain, touch, hearing, and heat perception-coexists with VM in one family.²¹

ADMINISTRATION AND MANAGEMENT

When it comes to treatment, VM is very similar to how conventional migraines are treated. There is a shortage of data about the effectiveness of treatment, and a Cochrane review conducted in 2015 discovered that there are no studies of high quality accessible for VM.²² Conservative approaches, symptomatic and abortive treatment during acute bouts, and preventative medicines are all part of the management strategy. The reduction of stress, the maintenance of good sleep hygiene, the treatment of anxiety, the avoidance of eating triggers, the avoidance of visual triggers, and the stabilization of hormone fluctuations are all examples of non-medical therapy.²³ Medications that can be used to treat acute vestibular attacks include anti-emetics, which are used to cure nausea, and vestibular suppressants, which are used to treat vestibular symptoms. Both of these medications are used to treat vestibular symptoms.⁹

SYMPTOMS IN CLOSE ASSOCIATION WITH MIGRAINE

TINNITUS

As both tinnitus and migraines are equally mysterious in their genesis, they may share a pathophysiology linked by the CNS. More specifically, migraine-related tinnitus can be caused by activation of the trigeminal nerve and, more commonly, central hypersensitivity.^{24,25} Certain kinds of migraine are associated with a higher incidence of tinnitus.²⁶⁻²⁸ Pulsatile tinnitus is another symptom that can be detected in migraine settings. This symptom can be addressed through the treatment of migraines, which includes the avoidance of dietary triggers, either with or without the use of medication.²⁹

Tinnitus and migraines may share a pathophysiology that is related to the CNS. This is because the origins of both conditions are equally unexplained. To be more specific, tinnitus that is associated with migraines can be brought on by stimulation of the trigeminal nerve and, more frequently, central hypersensitivity.^{24,25} There is a correlation between certain types of migraine and an increased occurrence of tinnitus. Pulsatile tinnitus is yet another symptom that can be experienced in migraine situations.²⁶⁻²⁸ This

symptom can be addressed through the therapy of migraines, which involves the avoidance of dietary triggers, either with or without the use of medication.²⁹ This treatment can occur either with or without the use of medication.

COCHLEAR MIGRAINE

Researchers have been more cautious when assessing the link between migraine and vestibular symptoms since 2012 when official diagnostic criteria were put in place. Contrarily, there is less information regarding the correlation between migraine and cochlear symptoms.³⁰ When headaches develop alongside or in connection to cochlear symptoms, such as variable or abrupt HL, a smaller proportion of individuals will have these symptoms. The original goal of introducing the concept of cochlear migraine in 2018 was to learn more about the relationship between migraines and other kinds of HL. The main diagnostic criteria include aural fullness in the afflicted ear and a unilateral sensorineural HL that is either constant or varies over time, both in frequency (low frequency or all frequencies), and does not include vertigo or moderate dizziness. Minor symptoms can include things like an aura before headaches start, tinnitus at the same time, a history of migraines or chronic headaches in the family, a stiff neck on one side (the side opposite the headlamp), sensitivity to light or sound, motion sickness, visual motion intolerance, or changes in atmospheric pressure, and a history of migraines or chronic headaches.^{31,32}

HEARING IMPAIRMENT

Subjective hearing changes are also common during virtual reality attacks; however, it is not apparent if these changes result from a peripheral or perceptual point of view. In a research conducted using a national database, it was discovered that migraines were independently linked to an increased risk of experiencing subjective HL and tinnitus.³³ When compared to the non-migraineurs, migraineurs were shown to have a higher likelihood of experiencing subjective headaches “(25.0% versus 16.6%, $p < 0.001$)” and tinnitus “(34.6% versus 16.9%, $p < 0.001$)”, as demonstrated by this study that involved around 13,000 individuals from the United States. A more significant number of migraineurs who had tinnitus also had

HL compared to those who did not experience tinnitus “(40.0% versus 15.3%, $p < 0.001$)”, and a higher proportion of migraineurs who had HL also experienced tinnitus compared to those who did not have HL “(58.1% against 27.3%, $p < 0.001$)”.³³ In addition, a recent meta-analysis concluded that a history of migraines is a risk factor for sudden sensorineural HL. The pooled hazard ratio for this risk factor was 1.84 (95% confidence interval: 1.11-2.57 ($p < 0.001$)).²⁹

SINUS PRESSURE

To define the symptoms of a headache attributable to rhinosinusitis, “IHS” has developed specific criteria. However, this only happens when rhinosinusitis flares up suddenly; the IHS does not consider chronic rhinosinusitis a headache. Patients suspected of having chronic rhinosinusitis often do not react to standard antibiotic treatments or have typical computed CT results. No signs of infection or inflammation in the sinuses or nasal canals are apparent, although these patients often describe rhinorrhea and pain or pressure in the center of the face. Many medical professionals are now investigating the possibility of seeing this condition as a variety of migraines rather than a sign of sinus or nasal disease.³⁴ Lacrimation, conjunctival injection, eyelid edema, and nasal congestion are all symptoms observed in patients who suffer from migraines.³⁵

CONCLUSION

Many etiologic factors are presented for headaches. The primary evaluation of the reason and decision

of admitting to which specialty was always done by the patients. Otorhinolaryngologists always focus on rhinosinusitis as the most frequent etiologic reason for headaches, whereas ophthalmologists initially consider refraction problems. We aimed to review migraines as a frequent cause of headaches. Although it is easy to diagnose classic migraines with aura, we tried to review non-classic forms in which many doctors have problems ruling out the options.

Secondly, the majority of people who suffer from migraines report experiencing vertigo or dizziness as the primary symptom rather than headaches of any kind. Due to this particular case, this article focuses on providing a description of vertigo related to migraine.

Source of Finance

During this study, no financial or spiritual support was received neither from any pharmaceutical company that has a direct connection with the research subject, nor from a company that provides or produces medical instruments and materials which may negatively affect the evaluation process of this study.

Conflict of Interest

No conflicts of interest between the authors and / or family members of the scientific and medical committee members or members of the potential conflicts of interest, counseling, expertise, working conditions, share holding and similar situations in any firm.

Authorship Contributions

All authors contributed equally while this study preparing.

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