Investigating the effect of using mobile phones on acoustic neuroma

Abstract

In this article, the effect of mobile phone use on the development and spread of acoustic neuroma has been investigated. The studied participants included all members aged between 20 and 69, which includes the residents of three different geographical regions, which have a total population of 1.3 million people. Thereafter, 165 members were selected from among those who were infected with acoustic neuroma as sample members considering the Cluster Random Sampling method. The number of sample members was determined based on Cochran's formula. The results show that urban people are more at risk of developing this type of tumor compared to rural people. In addition, people who had continuously used mobile phones for more than ten years were more infected with acoustic neuroma compared to others. Therefore, there is a direct and significant relationship between the amount of mobile phone use and the incidence of acoustic neuroma. It is worth mentioning that one of the most important ways to reduce the risk of being infected with an acoustic neuroma is to increase the distance from the mobile phone, not put it in the pocket, send text messages instead of making phone calls, not using this device as an alarm clock and not using it for a long and continuous time or on highways.

Keywords: *mobile phone, carcinogen, auditory nerve tumor, acoustic neuroma, electromagnetic radiation.*

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1. Introduction

Today mobile phones play an important role in human life and are used for all kinds of communication and media activities such as accessing information, listening to music and taking photos. The use of mobile phones is always associated with the question of health consequences for humans. Currently, approximately 1.9 billion people worldwide use cell phones, and that number rises to 220 million in the United States alone [1]. The amount of cell phone wave absorption varies depending on the distance of the cell phone from the ear and the frequency of the waves. Normally, more than 70% of the waves are absorbed by the skull and brain tissue and converted into thermal energy [2].

Radio frequency telecommunications systems emit invisible electromagnetic radiation. Cell phones send microwaves very close to the user's ear. This energy is absorbed by the skin, the inner ear, the vestibular nerve and the surface of the temporal lobe. In addition, various factors such as the distance of the mobile phone from the ear and the amount of frequency are effective in absorbing the waves, but the harmful effect of continuous telephone conversation is obvious and obvious [3]. Concerns about the dangerous level of electromagnetic waves from cell phones are increasing day by day, and many researchers are looking for a solution to these worries. Considering that many scientific fields deal with this question, it is expected that definitive answers to these questions will be given in a few decades. What is interesting is that with the progress of scientific research, the idea that waves from mobile phones are dangerous and can be carcinogenic is spreading [4]. In general, mobile phone waves are a type of energy in the form of radio frequency, which is an electromagnetic wave and is included in the category of non-ionizing waves such as harmful microwave and radar waves. Additionally, ionizing waves are known as carcinogenic waves and include waves such as x-rays and radon. Researchers have found that exposure to powerful radio waves from cell phones slightly increases the risk of developing malignant glioma brain tumors and non-cancerous tumors.

2. Research background

In reference [5], the objective is to study the effect of the use of mobile phones on hearing ability and balance. It should be noted that studies conducted on cell phone radiation and the risk of acoustic neuroma have provided conflicting results. In this regard, some tests have shown that there is no longer a risk of tumors appearing among mobile phone users; however, some tests have shown that the likelihood of having an auditory nerve tumor is higher in people who use a cell phone for a long time. In addition, the experiments show that acute exposure to microwaves emitted inside the body and under laboratory conditions does not affect the electrical conduction of the non-cochlear nerve as well as the physiology of the vestibular system in humans.

Analog cell phones are less exposed to electromagnetic interference than digital cell phones. Additionally, the results

indicate that there is insufficient evidence of vestibular and cochlear damage from cellphone use. Moreover, in reference [6], it is pointed out that there is no plausible explanation as to the consistency between the significant increase in risk due to the use of cordless telephones and the relatively stable trend of the incidence of auditory nerve tumors. However, the limited increased risk linked to the intensive use of the mobile phone and to the exposure to the waves it emits must be studied. The results of this study show that cell phone radiation can double the risk of auditory nerve tumors on the side of the head used to talk on a cell phone. Also, it can increase brain activity and damage the nerves around the ear. Additionally, in reference [7], the effects of mobile phone use on the incidence of auditory nerve tumors and types of cancers were studied and it was pointed out that although available research and evidence on the risk of contracting tumors from cell phones does not provide clear and direct evidence that cell phones cause tumors or cancers, the evidence does not support a link between exposure to radiofrequency and micro-radiation waves from mobile phones and the direct effects on health. Therefore, the lack of cancer evidence regarding cell phone use should not be interpreted as evidence for the absence of tumors and cancer risk. Therefore, the excessive use of mobile phones should be considered very seriously and cautiously in the field of tumor prevention.

In reference [8], the influence of the duration of mobile phone use on the occurrence of auditory nerve tumors and their increased risk in Canada was studied. In reference [8], the influence of mobile phone usage time on the occurrence of auditory nerve tumors and its increased risk in Canada was studied. In this study, data from the Canadian Cancer Registry was used to calculate annual tumor incidence between 1992 and 2015.

Accordingly, the number of newly diagnosed cases was compared with the number predicted by applying the risks derived from epidemiological studies to estimate the population by age. Specifically, this number is calculated by determining the annual prevalence of mobile phone users. The lack of increased tumor incidence associated with a significant increase in cell phone use suggests that there may not be a causal relationship between cell phone use and the development of hearing tumors. Especially in short periods, a recent study reported an increased risk of acoustic neuroma in people living in Sweden who used mobile phones for ten years or more [9]. However, in this report, no substantiated conclusions were presented regarding usage under ten years and other usage criteria such as total hours of usage or total number of phone calls.

3. Auditory nerve tumor

An ear tumor or acoustic neuroma is a type of benign, non-cancerous tumor that forms on the main nerve of the inner ear (cochlear vestibule) and slowly grows there. The formation of an ear tumor is dangerous because the eighth nerve, responsible for the auditory and balanced system of the brain, is disturbed due to the pressure exerted by the acoustic tumor, and the auditory and balanced system of the brain is affected. Auditory nerve tumors arise from the Schwann cells that surround the nerve fibers and are therefore called vestibular schwannoma. Schwannoma can occur in any cranial or peripheral nerve, but in the brain, acoustic neuroma is the most common schwannoma. These neuromas usually begin to develop where the central nervous system transfers to the peripheral nervous system, called the Acoustic Porus [10].

It should be noted that continued tumor growth without control can be life-threatening. According to reports from the Acoustic Neuroma Association, asymptomatic acoustic neuromas probably represent up to 0.01% of the general population, and approximately one in 100,000 acoustic neuromas are diagnosed as symptomatic. Additionally, the worldwide incidence rate of acoustic neuroma ranges from one to 20 cases per million population each year [11]. Most acoustic neuromas are diagnosed in patients between the ages of 30 and 60, and they are rarely diagnosed in people younger than 30.

In general, symptoms of auditory nerve tumor that may occur over time include problems with balance, dizziness, permanent and temporary facial numbness and tingling, facial weakness, taste changes, difficulty in swallowing and hoarseness, headache, unsteadiness and confusion.

Regarding the factors that increase the likelihood of ear tumors, it should first be mentioned that about 5% of people with acoustic tumors have a genetic background and there is no other reason for cause disease. The second factor that can be mentioned as an increase in ear tumors is the exposure of the head to high energy rays. For example, in some studies it has been proven that there is a relationship between excessive cell phone use and acoustic tumors, but no more acceptable research has yet been done.

There are two types of acoustic neuroma: the sporadic type and a type associated with a syndrome called neurofibromatosis type II (NF2). NF2 is an inherited genetic disease characterized by the growth of non-cancerous tumors in the nervous system. Acoustic neuromas are the most common type and are often diagnosed on the basis of tumors affecting both ears by the age of 30, which is a rare condition. It represents only 5% of acoustic neuromas. Thus, this means that the vast majority are of the sporadic type [10]. Doctors don't know what causes the sporadic type. Exposure to high doses of radiation, especially in the head and neck region, is one of the known risk factors for acoustic neuroma.

4. Research method

In this article, a population-based and case-control epidemiological approach was used to study the increased risk of acoustic neuroma in people who use mobile phones a lot. In this research, patients with auditory nerve tumors were studied and examined.

However, in order to confirm that people have auditory nerve tumors first, its symptoms were studied in humans. Signs and symptoms that indicate an acoustic neuroma include hearing loss in one ear, often accompanied by tinnitus in the affected ear. Sometimes these early signs and symptoms are mistaken for the natural changes associated with aging. Acoustic neuromas usually develop slowly over several years; therefore, they are easily overlooked and diagnosis is often delayed. Since the path of nerve fibers that send balance signals from the inner ear to the brain are adjacent to the auditory nerve fibers and pass through the same bony internal auditory canal, it can occur with an enlarged acoustic neuroma mass , dizziness and loss of balance. This study included all people between the ages of 20 and 69, which involves residents of three different geographic areas that have a total population of 1.3 million people. Case examples were selected from people with acoustic neuroma. A total of 160 eligible cases of acoustic neuroma were identified and the control group (n=838) was randomly selected based on age, sex and residential area. The participation rate was 93% (148 people) for the cases and 72% for the control group (604 people). In a second step, by carrying out the necessary tests, it is confirmed or invalidated that the people suffer from tumors of the auditory nerve. After confirming that people suffered from neural network tumors, sample members were selected by the multistage cluster sampling method. The number of sample members is determined by Cochran's formula.

The records of these individuals regarding the amount of mobile phone usage over the past ten years were reviewed. Based on the average duration of cell phone use in recent years, the effect of cell phone use on the development of neural network tumors in these individuals is investigated.

The potential for increased cancer risks due to exposure to wireless radiation has always been a major concern for many cell phone users. In common use, approximately 50% of radiated microwave energy is absorbed by the lateral tissues of the head near the ear. Therefore, central nervous system cancer has attracted the attention of the public, scientific researchers and the mobile phone industry almost since the introduction of this general invention in contemporary society [12]. In addition, acoustic neuromas develop slowly over several years, and the average time to diagnosis is estimated to be more than five years. Given the recent introduction and popularity of digital phones, this study considered five years as the time of first normal use.

5. Findings

The risk estimate does not increase with estimated usage such as cumulative hours or cumulative calls. When data analysis was restricted to acoustic neuroma on the same side of the head where cell phones were commonly used, the odds ratio for acoustic neuroma was 3.9 (1.6 to 9 ,5). For the other side of the head, this value is equal to 0.8 (0.2 to 2.9).

As exposure to microwaves from mobile phones is directly related to the output power used by the phone to communicate with the base station, separate analyzes have shown the risk estimate to be 0.7 (0. 3 to 1.6) for people using mobile phones, mainly in rural areas. Mainly in urban areas, this risk was equal to 1.4 (0.9 to 2.3). It is generally recognized that the power output of cell phones varies depending on the geographic location of the user, and the power output has been shown to be higher in rural areas than in urban areas. In this study, increased risk was only investigated for long-term use (more than ten years) and other measures of use such as cumulative hours of use or cumulative number of calls have not been taken into account. It should be noted that most people used analog phones more than ten years ago, but they have gradually switched to digital phones. It is clear that the results are based on the combined use of analog and digital phones and do not indicate the relative risk of using analog or digital phones alone.

Acoustic neuromas seem to develop spontaneously and for mostly unknown reasons; however, acoustic neuromas are benign tissue masses that appear on the cochlear vestibule or auditory nerve leading to the brain from the inner ear.

This nerve path runs through the bony internal auditory canal which is about 2cm in length, and this is where acoustic neuromas originate from the sheath around the cochlear vestibule and as they grow they displace normal tissue from the brain and exert pressure on the brain, but they do not spread to the brain. In other words, the brain tissue is not attacked by the tumor. The slowly growing tumor spreads from the internal auditory canal to the area behind the temporal bone on the side of the head.

When a large tumor exerts strong pressure on the brainstem and cerebellum, vital functions are threatened. Many sensory and motor nerves are located in the lateral and medial regions of the brainstem.

6. Conclusion

People who have used mobile phones continuously for more than ten years are more likely to suffer from auditory nerve tumors than others. Therefore, there is a direct and significant relationship between the amount of mobile phone use and the incidence of auditory nerve tumors. The risk of auditory nerve tumors is higher in city dwellers than in rural dwellers. Therefore, the place of residence and therefore the behavior and culture that prevails in this region can also affect the risk

of contracting this type of tumor. It should be mentioned that one of the most important ways to reduce the risk of getting infected with acoustic neuroma is to increase the distance from the cell phone, do not put it in the pocket, d 'send text messages instead of making phone calls, do not use this device as an alarm clock, and do not use it for a long and continuous period of time or on highways.

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