

TINNIS IN PATIENTS WITH CHRONIC NEPHROPATHY: WHAT IS THE EVIDENCE

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Abstract: **Objective:** **Methods:** **Results:** **Conclusion:** Hearing disorders, such as tinnitus, are increasingly present in the population. A higher incidence of tinnitus is suggested in nephropathic patients, those using ototoxic medications and undergoing dialysis. Therefore, a literature review was carried out with the aim of analyzing the evidence that correlates these factors. It was noted that evidence relating the presence of tinnitus in patients with chronic nephropathy, especially in that undergoing dialysis, is still scarce in the literature. However, the pathophysiology of both conditions can be correlated, in order to consider chronic nephropathy as a risk factor for tinnitus. Thus, the importance of audiological monitoring in the patients in question and the need for further research correlating the themes can be seen.

Keywords: Tinnitus, Chronic Nephropathy, Dialysis

INTRODUCTION

Hearing, the second essential sense, functions as a means of survival for human beings around themselves, it is no surprise that of the 5 senses: vision, hearing, taste, smell and touch, it is in second place.

For this process to occur properly, some well-established factors are necessary, such as: an intact and functional anatomy of the external auditory canal, passing through the middle ear to the inner ear, a physiology that functions properly, in addition to other important characteristics such as nerve conduction and preserved sensory.

Pathologies related to hearing are, for the most part, invisible, which makes their understanding difficult for society in general. An individual who is hearing impaired, or who suffers from tinnitus, is susceptible to social, physical and occupational implications in their life. Unfortunately, the number of people with this problem is growing alarmingly, and

the incidence of hearing changes induced by the use of ototoxic medications, one of the causes of hearing loss, is still unknown.

The influence of hemodialysis on hearing loss is still unclear, metabolic changes seem to be associated. Many studies have been carried out regarding the susceptibility of hair cells to various metabolic disorders, however, the association between hearing loss and chronic renal failure remains uncertain.

It is important to highlight that a hearing-impaired individual suffers social, physical and occupational implications in their life. Unfortunately, the number of people with this problem is growing alarmingly, and the incidence of hearing changes induced by the use of ototoxic medications is still unknown, which justifies the need and urgency to research the subject.

METHODOLOGY

This is an integrative literature review article carried out from August 2023 to March 2024. The aim of the work is to analyze the evidence on tinnitus in patients with chronic nephropathy.

The study was carried out through research in databases such as: Scielo, PubMed and international otorhinolaryngology archives. Articles and bibliographical reviews in Portuguese and English, available in full, published between 2004 and 2023 and that addressed the proposed subject were included. Duplicate articles that were not available in full and that did not address the proposed topic were excluded. Furthermore, a book published in 2003 was used.

The articles studied were evaluated in a comparative way, in order to gather the main associations between tinnitus and patients with chronic nephropathy, as it is a scarce subject in the scientific literature. The results were presented in descriptive form at the end of the work.

LITERATURE REVIEW

Tinnitus is defined as an endogenous sound impression, a sensation of sound in the absence of a corresponding external sound stimulus (2). It represents one of the most common otological problems, affecting around 28 million Brazilians (2) at some stage of their lives, often interfering intensely with the quality of life of patients affected by it. (1) Tinnitus can be due to non-auditory pathologies, for example, cardiovascular, metabolic, neurological, pharmacological, odontogenic or psychogenic, but most of them are auditory causes. (2) Around 20% of patients who have this symptomatology end up reporting tinnitus as impacting or disabling their quality of life, damaging activities at work, leisure, social and domestic environments, with repercussions on the psychic sphere, leaving people irritated, anxious, distressed, depressed and insomniac.(2)

It can be perceived in a number of ways, such as being inside one or both ears, in or around the head, or as a distinct external noise. The sound is usually a buzzing, ringing, or hissing noise, although it can also sound like other noises. It can be continuous or intermittent. While both can have a significant impact on the patient, the latter is usually not related to a serious underlying medical problem.

In terms of its form, it can be continuous or intermittent, constant, monotonal or polytonal. Its intensity can vary, from a buzzing that is only audible in quiet environments, to buzzing that causes great discomfort to the individual. Tinnitus can be considered mild, when it is only noticed by the patient in some situations; moderate, when the patient notices its existence but does not feel discomfort; intense, when it is unpleasant and causes discomfort, affecting day-to-day activities; and severe, when it becomes intolerable, it is heard uninterruptedly, accompanying the individual at all times. (3)

The pathophysiological mechanism of this symptom is complex and multifactorial. Its occurrence is often related to hearing malfunction. (4) The well-known mechanism is the negative regulation of intracortical inhibition related to damage to the cochlea. Decreased output from the damaged cochlea causes less inhibition in central auditory structures. The high spontaneous multiunit activity detected in the dorsal nucleus of the cochlea may project to higher auditory centers. It eventually leads to activation of the auditory perceptual machinery, including the primary auditory cortex, responsible for tinnitus. Subtotal cochlear damage without changes in auditory threshold, a possible cause of tinnitus in patients without detectable hearing loss, is related to degeneration of the auditory neuron with damage to the inner hair cell synapse. (4)

People affected by tinnitus experience varying degrees of discomfort, having different impacts on well-being. The incidence of tinnitus and hearing disorders has increased as the population's age increases. (3) Two factors related to this symptomatology must be differentiated: the intensity of the tinnitus signal and the severity of the symptom, that is, the discomfort it causes in the patient's daily life. (1)

Factors such as hearing loss, concomitant changes in the middle ear, changes in the vestibular system, headaches, as well as upper airway infections showed a significant role in determining the degree of discomfort. Aggravating factors, such as physical and mental fatigue, anxiety, stress and depression lead to a worsening of the discomfort perceived by the patient. (2) The population most affected by tinnitus are the elderly reaching up to 15% in the age group over 65 years old, in the USA. (3)

Chronic kidney disease consists of the progressive and irreversible loss of kidney function (which has a glomerular, tubular

and endocrine part), due to damage that can have different etiologies. In advanced cases, in the terminal phase of chronic renal failure (CRF), the kidneys are unable to maintain the patient's homeostasis. (7) There has been a significant increase in cases due to the increase in the population's life expectancy (8), a factor common between the appearance of tinnitus and kidney disease.

It is estimated that in the USA there are 15 to 18 million people with end-stage kidney disease, requiring hemodialysis. (9) In Brazil, despite the lack of data, around 3 to 6 million Brazilians have chronic kidney disease and just over 100,000 receive dialysis therapy. (8) Due to diagnostic difficulty, the exact prevalence in the population remains uncertain, however it is established that the number of patients undergoing dialysis therapy in Latin America has increased in recent years, which may be associated with difficulties in accessing treatments for underlying diseases. (8) Males had a higher incidence of needing hemodialysis (57.2%), as well as white (45.2%) and aged 45-64 years (43.4%), with hemodialysis predominating as a therapeutic modality (90.1%). (8)

Among the main causes of chronic kidney disease, systemic arterial hypertension (34%), diabetes mellitus (29%) and glomerulopathies (13%) stand out (7, 8). It is known that these underlying diseases, as well as causing chronic kidney disease, also cause an increase in cardiovascular risk (8), having a systemic deleterious effect. Chronic kidney disease, as it is an extremely destabilizing condition, ends up resulting in a combination of factors that can lead to cochlear dysfunction, which can predispose to the appearance of tinnitus.(4)

Studies that correlate tinnitus with chronic kidney disease are still scarce, but it is possible to draw some parallels between the pathologies. Some of these concluded that patients with hypertension, diabetes mellitus,

heart failure, liver cirrhosis and traumatic injury to the central nervous system are factors that contribute to the development of tinnitus in patients with chronic kidney disease (4). This is due to cochlear damage caused by mechanisms that are not yet completely understood. It is known that the cochlea and kidney have analogous physiological mechanisms, including the transport of fluids and electrolytes in the blood vessels of these two structures. Therefore, the accumulation of nephrotic substances such as uric acid, creatinine and urea, and the medications involved in the treatment of kidney disease, can cause cochlear damage.

Furthermore, the systemic vasculopathy of underlying diseases, which culminate in chronic kidney disease, can also affect the blood vessels of the cochlea, leading to microcirculation dysfunction, which in turn leads to ischemic damage to the structures of the inner ear. This ischemic damage affects the dynamics of hearing and can cause hearing disorders such as tinnitus. It is postulated that inflammation of microvessels plays a central role in this process of damage to microcirculation and ischemia. (4) There is also some evidence highlighting the impact of chronic kidney disease on the central nervous system. (4)

Furthermore, the use of ototoxic substances as a factor in the etiopathogenesis of tinnitus has been established in the literature (10). More than 130 drugs and chemical agents have been considered potentially ototoxic (11). In patients with CKD, the use of furosemide and diuretics such as ethacrynic acid, digitalis cardiotonics, as substances harmful to the cochlea, stands out (10).

Thus, it is clear that patients with chronic kidney disease had a 3 times higher risk of developing tinnitus than the general population, and those with end-stage kidney disease on dialysis had a 4.5 times higher

risk. (4) These are still embryonic clues and hypotheses, but they open up a broad scope for further studies.

Therefore, it can be stated that chronic kidney disease is an important risk factor for the development of tinnitus (4), a pathology that directly impacts quality of life to varying degrees. (two). Finally, it is postulated that the more advanced the kidney disease is, the greater the tendency to develop this symptom, but this correlation still needs to be elucidated (4) in more depth by further research.

FINAL CONSIDERATIONS

The influence of hemodialysis on hearing loss is still unclear, metabolic changes seem to be associated. Many studies have been carried out regarding this subject, however, the association remains uncertain.

A hearing-impaired individual suffers social, physical and occupational implications in their life. Unfortunately, the number of people with this problem is growing alarmingly, and the incidence of hearing changes induced by the use of ototoxic medications is still unknown. It is important to highlight the vulnerability previously established in these patients due to the fact that they are undergoing a process as complicated as hemodialysis, which makes the presence of tinnitus an important cause of morbidity.

Thus, the extreme importance of audiological monitoring of patients with chronic renal failure who use or have used, at some point in their treatment, ototoxic medications, or of patients undergoing hemodialysis treatment, since they present such a risk factor is highlighted. risk for the development of hearing changes.

Therapeutic and technological advances have caused the survival of patients, particularly those with chronic diseases, to increase significantly. These often remain with complications or sequelae, therefore, due to the

lack of studies regarding the changes caused by hemodialysis in patients with chronic renal failure, the importance of encouraging

new research involving this population is reinforced, in order to provide them with subsidies for a better quality of life.

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