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Original Article

The zinc Sulphate as a treatment modality in the patients suffering from tinnitus

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Abstract

Objective: The aim of this study was to find out the prevalence of hypozincemia in patients suffering from Tinnitus and to investigate the effect of Zinc therapy upon the severity of Tinnitus.

Material and Methods: We studied 66 who suffered from tinnitus, which were randomized to two groups according to the zinc level including $< 50\mu\text{g}/\text{dl}$ and $> 50\mu\text{g}/\text{dl}$ groups. The zinc level was measured in non-diluted serum by flame atomic absorption spectrophotometry from fasting blood samples.

Results: The zinc level in $< 50\mu\text{g}/\text{dl}$ and $> 50\mu\text{g}/\text{dl}$ groups, before and after treatment (47.750 vs. $77.3\mu\text{g}/\text{dl}$, $P < 0.02$; $86.6\mu\text{g}/\text{dl}$ vs. 98.2 $50\mu\text{g}/\text{dl}$, $P < 0.001$, respectively) was statistically significant. Hence, in Placebo group, before and after treatment the zinc level was not statistically significant ($73.2\mu\text{g}/\text{dl}$ vs. $72.6\mu\text{g}/\text{dl}$, respectively).

Conclusion: The result showed that the mean of subjective tinnitus in the zinc group decreased. However, the decrease in severity of the tinnitus was not significant in patients receiving placebo. The zinc level increased significantly in the patients treated with zinc. This study indicates that administration of zinc has a beneficial effect on tinnitus but these results still have to be confirmed in clinical trials with larger samples.

Keywords: Hypozincemia Tinnitus; zinc sulphate; Atomic Absorption spectrophotometry

1. Introduction

Millions of people suffer from tinnitus, which is also known as "ringing in the ears". The level of symptoms that people experience will vary from one person to another. Tinnitus is one of the most common hearing problems affecting 17% of all population and 33% of elderly¹. Evidences in the literature suggest prevalence rates of zinc deficiency in individuals with tinnitus from 2 to 69%, affecting elderly individuals more frequently. Tinnitus is an otoneurological symptom that causes great suffering to the patient, including suicide attempts². The daily chores and sleep of nearly 1 to 2% of the population may be affected by

this problem³. About 300 diseases may have tinnitus as one of its manifestations, which may be classified according to the affected region as, peripheral, central, extra-auditory or of unknown origin, the last one in 50% of the patients. The sound, continuous or intermittent, constant and mono or polytonal is generally referred as a shrill, whistle, waterfalls or shower noises, hissing sound of pressure pans, bell ringing, insect flutter, heart pulsation or butterfly wing beating. Discomfort is not always associated with the intensity of the ringing, which is variable, but alongside dysesthesia and dizziness it is one of the main otoneurological manifestations⁴.

Tinnitus should be considered as symptoms of disease or as sequels following aggressions to the auditory system², but it is important to distinguish it from auditory hallucinations in psychotic patients hearing voices or sounds of music⁵. Several theories try to explain the physiopathology of the generation and perception of tinnitus. The current consensus is that tinnitus results from aberrant neural activity in the auditory system, generally of excitatory nature⁶ and interpreted as sound by the auditory cortex⁷. Zinc is one of the essential elements known to play an important role body metabolism. Zinc is also present in the synapses of the auditory system. Zinc deficiency may therefore result in some functional inner ear disorders such as sensory neural hearing loss, vertigo and tinnitus. The aim of this study was to assess any possible beneficial effect of zinc on tinnitus.

2. Materials and Methods

We performed placebo, controlled, randomized, prospective investigation. We intended to study 66 tinnitus sufferers, but settled on 60 due to drop out. All had serum zinc levels measured and, irrespective of the findings, 35 were randomized to two months daily zinc sulphate tablet supplements or placebo for 25 patients. The zinc level was measured in non – diluted serum by flame atomic absorption spectrophotometry from fasting blood samples (normal values: 50-150µg/dl). A questionnaire that scored tinnitus subjectively between 0 and 5 was given to patients before zinc treatment. After two months of treatment (zinc 50 mg daily to zinc group, placebo pill containing starch to placebo group) were performed again. There was no difference in age, sex, duration of tinnitus, and affected ears between the patients treated with zinc and those treated with

placebo. The levels of zinc in serum were determined both before and after treatment.

Questionnaire about Tinnitus:

1. Do you have any sleep disturbance due to tinnitus?
Always (1.0); sometimes (0.5); never (0)
2. Can you get to sleep easily?
Never (1.0); sometimes (0.5); always (0)
3. Do you hear tinnitus sound in a quiet place?
Always (1.0); sometimes (0.5); never (0)
4. Do you hear tinnitus during daily activities?
Always (1.0); sometimes (0.5); never (0)
5. Do you forget tinnitus sound while working?
Never (1.0); sometimes (0.5); always (0)

3. Results

The patients in the zinc group were divided into two groups: first patients with a zinc level of 50µg/dl or less (n=16) and second patients with a zinc level greater than 50µg /dl (n=19). Comparison of serum zinc level showed that in first group before treatment the zinc level was 47.7µg/dl, and after treatment was 77.3µg/dl (P< 0.02). Hence, in the second group before treatment the zinc level was 86.6µg/dl, and after treatment was 98.2µg/dl (P<0.001). In Placebo group, before treatment the zinc level was 73.2µg/dl, and after treatment was 72.6µg/dl, which showed no significant difference. Comparison of subjective scoring (0- 5) indicated that in the first group the score before treatment was 3 (2.3-4.2), and after treatment was 1 (0.1-1.8). In the second group before treatment it was 3 (2.2-4.2), and after treatment was 1 (0.4-2.1). The result showed that the mean of subjective tinnitus in the zinc group decreased. However, the decrease in severity of the tinnitus was not significant in patients receiving placebo.

Table 1. Comparison of zinc level and placebo before and after treatment

| Group | Before treatment | After treatment | P value |
|---------------------|------------------|-----------------|-----------------|
| Zinc group< 50µg/dl | 47.7µg/dl | 77.3µg/dl | < 0.02 |
| Zinc group> 50µg/dl | 86.6µg/dl | 98.2µg/dl | < 0.001 |
| Placebo group: | 73.2µg/dl | 72.6µg/dl | Not Significant |

Table 2. Comparison of subjective scoring (0- 5)

| Group | Before treatment | After treatment |
|---------------------|--------------------------|--------------------------|
| Zinc group< 50µg/dl | median Score 3 (2.3-4.2) | median Score 1 (0.1-1.8) |
| Zinc group> 50µg/dl | median Score 3 (2.2-4.2) | median Score 1 (0.4-2.1) |
| Placebo group | median Score 3 (2.1-4.1) | median Score 3 (1.9-4.8) |

4. Discussion

Zinc is an essential trace element present in all organs, tissues, fluids, and secretions of the body and it is

widely distributed in the central nervous system, including the auditory pathway in synapses of the VIII nerve and in the cochlea. Zinc is an essential component of Cu/Zn superoxide dismutase (SOD) and in certain

enzymes and it is important for proper function of the immune system. We think that zinc has a role in the pathophysiology of tinnitus, although there is little information about it. In this study, the patients are still being followed up to detect recurrences of tinnitus. It remains to be seen whether the longer duration of treatment has more significant results. Two prospective, placebo-controlled studies found conflicting results. The first reported no significant difference between Zn²⁺, 22 mg three times daily, and placebo^{8,13}. However, a more recent study reported a statistically significant improvement in subjective rating of tinnitus both within the Zn²⁺ 50-mg daily treatment group and in comparison with placebo^{9,14}. Two additional, nonplacebo-controlled studies investigated the incidence of zinc deficiency in patients with tinnitus along with the potential for improvement with zinc replacement. The first study reported a significantly increased incidence of zinc deficiency in tinnitus as compared with healthy controls and a significant decrease on a subjective rating scale with Zn²⁺ 34-68 mg daily over two weeks¹⁰. The second study found no strong relationship of zinc deficiency and tinnitus and failed to demonstrate significant improvement with Zn²⁺ 220 mg daily for two months, although a trend toward improved symptoms in elderly patients with hearing loss was noticed¹¹. In those with normal hearing, zinc deficiency may play a role in the development of tinnitus, and zinc supplementation may be helpful in those cases^{8,12}. Our study showed that the mean of subjective tinnitus in the zinc group decreased. However, the decrease in severity of the tinnitus was not significant in patients receiving placebo.

5. Conclusions

This study indicates that administration of zinc has a beneficial effect on tinnitus but these results still have to be confirmed in clinical trials with larger samples.

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