



Evaluation of The Zinc, Copper and Iron Serum Level in Patients with Nasal Polyposis



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Abstract

Background: In the current study, we evaluated the zinc, copper, and iron serum levels in patients with nasal polyposis.

Material and methods: In this case-control study 50 patients with nasal polyposis diagnosed by paranasal sinuses endoscopy, involved as case group. Fifty participants in control group were selected among patients who referred for nasal septoplasty. Participants' demographic and clinical information was collected through interviews and complete examinations and data was recorded using a questionnaire. Then, 10ml of venous blood of each participant was taken and each blood sample was examined concerning serum iron, zinc, and copper levels.

Results: The mean of serum zinc level was 80.94 ± 22.39 mg/dL in patients with nasal polyps and was 93.76 ± 23.32 mg/dL in healthy subject [$p=0.006$]. The mean of serum copper level was 87.2 ± 31.88 mg/dL in the case group and was 101.22 ± 29.88 mg/dL in the control group indicating significantly higher level of serum copper in healthy subjects [$p=0.02$]. With respect to serum iron level, no statistically significant difference was seen between two groups, although serum iron level was higher in the control group [97.38 ± 28.88 vs. 107.24 ± 31.41 , $p=0.11$].

Conclusion: According to the current study, low serum levels of trace elements [Zn, Cu and iron] is seen in patients with nasal polyposis.

Keywords: Zinc; Copper; Iron; Nasal polyposis

Introduction

Nasal polyposis is a chronic inflammatory disease of paranasal sinuses and characterized by focal hyperplasia of nasal mucous tissue [1]. Polyposis of the nose and sinuses leads to symptoms such as nasal congestion, difficulty in breathing, headache, anosmia, rhinorrhea, and postnasal drip. In addition, they can result in pressure necrosis, erosion of the bony wall of the sinuses, and deformation of facial skeleton [2,3]. The prevalence of this disease is 2.5% among the general population and 20% of patients with chronic sinusitis [4]. Although the mechanisms involved in the development of nasal polyps are not well known yet, inflammation is an important factor in the development of nasal polyps [5]. In 90% of patients with nasal polyps, eosinophil is the most common inflammatory cell. These cells have a proven ability in production and release of molecules and strong regulative mediators. The percentage of eosinophil in mucous determines disease severity and reduces treatment success [6,7]. Trace elements are a series of metallic and non-metallic elements and human body requires small amounts of them to function properly [8]. These elements are present in many tissues of the body and their reduction can result in the increase of cellular destruction tendency which is involved, in fact, in the pathogenesis of many diseases, including chronic upper

airway inflammation. The role and importance of these elements have already been identified in many diseases such as neoplasm. Zinc and copper have a crucial role in the inflammation control and these element deficiencies can lead to defects in the regulation of the immune system [8,9]. Although a few studies examined tissue level of zinc, copper, and iron in patients with nasal polyps, no study has yet investigated serum levels of these elements in patients with nasal polyposis. In the current study, we evaluated the zinc, copper, and iron serum levels in patients with nasal polyposis.

Material and Methods

After approval by local ethics committee and obtaining written informed consent, in this case-control study 50 patients with nasal polyposis diagnosed by paranasal sinuses endoscopy, involved as case group. Fifty participants in the control group were selected among patients who referred for nasal septoplasty. The easy sampling method was continued to achieve enough sample size. Patients with head and neck cancers, metabolic diseases, and history of nasal and sinus surgery were excluded from the study. Homogeneity of two groups in terms of sex and age was considered during recruitment. Each of control group patients was examined not to have allergic rhinitis and nasal polyps by

an otorhinolaryngology specialist. Participants' demographic and clinical information was collected through interviews and examinations and data was recorded using a questionnaire. Then, 10ml of venous blood of each participant was taken and each blood sample was examined concerning serum iron, zinc, and copper levels. The collected data were analyzed using SPSS [version 18]. The significance level considered as $p < 0.05$.

Results

In this case-control study 50 patients as case group and 50 participants as control group involved. The mean age of participants was 26.36 ± 4.96 years old. The case group mean age was 25.7 ± 4.74 years old and mean age of the control group was 27.02 ± 5.14 years old [$p = 0.18$]. Thirty females were in case group and 29 were in control group. Twenty males were in case group and 21 were in control group. The mean of serum zinc level was 80.94 ± 22.39 mg/dL in patients with nasal polyps and was 93.76 ± 23.32 mg/dL in healthy subjects [$p = 0.006$]. The mean of serum copper level was 87.2 ± 31.88 mg/dL in the case group and was 101.22 ± 29.88 mg/dL in the control group indicating significantly higher level of serum copper in healthy subjects [$p = 0.02$]. Considering mean serum iron level, no statistically significant difference was seen between two groups, although serum iron level was higher in the control group [97.38 ± 28.88 vs. 107.24 ± 31.41], [$p = 0.11$]. Serum iron level in smoker and non-smoker patients was 111.35 ± 26.93 mg/dl and 99.61 ± 31.05 mg/dl, respectively [$p = 0.10$]. Serum zinc level was 82.74 ± 25.18 mg/dl in smoker patients and 88.73 ± 23.15 mg/dl in non-smokers, and serum copper level was 89.78 ± 31.53 mg/dl and 95.53 ± 31.62 mg/dl in smoker and non-smoker patients, respectively [$P > 0.05$]. Two groups were not significantly different concerning serum zinc and copper levels.

Discussion

The current investigation aimed to compare patients with nasal polyposis and healthy subjects in terms of serum zinc, copper, and iron levels. The results showed that patients with nasal polyps have significantly lower levels of serum zinc and copper than healthy subjects. Also, serum iron level was lower in patients with nasal polyps but not significantly. There are a few studies on the tissue level of trace elements, but no studies have investigated yet serum zinc, copper, and iron levels in patients with nasal polyposis. In a study by Rostkowska N [10]. On 41 samples of nasal polyp tissues in 2005, the tissue level of copper, zinc, selenium, and plumbum was examined and it was found that the level of all these elements in polyp tissue was significantly lower than normal nasal tissue. They assumed that such a considerable reduction of trace elements might be the result of the different histological structure of the polyp tissue and poor vascularization [10]. In another study by Okur et al. [11], the content of zinc and selenium tissue was explored in 64 patients and it was observed that the levels of these elements in nasal polyps are significantly lower than normal mucosa tissue. They suggested the possible role of Zn depletion in the pathogenesis of nasal polyp formation.

In another study by Christudoss P et al. [12], serum and tissue levels of zinc and urine zinc/creatinin ratio were examined in

patients with benign and malignant prostatic hyperplasia and it was found that tissue and serum levels of zinc are significantly lower in patients with benign and malignant prostatic hyperplasia compared to healthy individuals. The content of zinc was more in patients with benign hyperplasia than patients with malignant hyperplasia. In addition, it was observed that urinary excretion of zinc in patients with malignant prostate was significantly increased compared to other two groups. It seems that the activation of inflammatory mechanisms and tissue catabolism increase the excretion of trace elements, followed by renal excretion increase. Increased urinary excretion of zinc in patients with chronic inflammation and malignancy has been also observed in other studies [13-18].

According to the results of previous studies, serum copper level increases in inflammatory reactions and there is a significant and direct relationship between the severity of inflammation and copper serum level [19,20]. It is concluded that low levels of Cu influence the inflammation process occurring in the polyp tissue and stimulate growth of the polyps [10]. The functional ability of Zn and Cu as an antioxidant and cell membrane stabilization prevents damages induced by free radicals in inflammatory processes [21,22]. Obviously, the level of inflammation and inflammation-induced damages are higher in individuals suffering from trace elements deficiency.

Low levels of trace elements [both in tissue and serum] in patients with nasal polyposis indicate injury in the tissue and weakening in the antioxidant system in long-lasting oxidative stress. Imbalance between oxidant and antioxidant system in the mucosal lining of nasal cavity, especially during an inflammatory reaction, can cause nasal mucosal damage either due to degradation of the epithelial basement membrane, which may be an initiation factor for polyp formation [11].

Conclusion

According to the results, low serum level of trace elements [same as low tissue levels of trace elements] is seen in patients with nasal polyposis.

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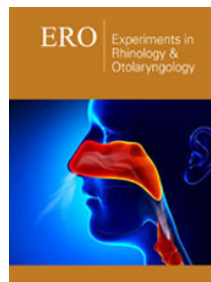
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