Trace Elements in Nasal Polyps

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ABSTRACT

The reason why nasal polyps occur has not been explained yet. In the literature, the role of immunological factors are considered and broadly discussed, but there is no information on the role of microelements in the pathogenesis of nasal sinusosal polyposis. In this study, concentrations of Cu, Se, Zn, and Pb in tissue of nasal polyps were determined. The tissue samples were taken from 41 patients during polypectomy procedures, whereas healthy tissue from nasal mucosa was sampled from 10 patients during endonasal surgery. The concentrations of the elements were determined by atomic absorption spectrometry. It was found that the concentrations of all the elements were significantly lower in polyp tissues than in healthy nasal mucosa. The reasons for this are unclear in the present study.

Index Entries: Trace elements; nasal polyps.

INTRODUCTION

Nasal mucosa polyps occur in patients with disturbed local homeostasis of the mucous membrane. The pathogenesis of their origin has not been accurately explained yet. The latest studies have proved nasal sinusosal polyposis (NSP) to be a disease of multifactorial etiology. One of the main mechanisms of the generation of polyps are local inflammatory processes accompanied by immunological system disorders (1). In the literature, the possible influence of particular immunological factors (e.g., cytokines) on the development of nasal polyps are considered and broadly discussed.
However, there is no information on the presence of microelements or of their role in the pathogenesis of the disease.

Trace elements can be found in many substances and enzymes of paramount importance for biological processes occurring in the human body. Both deficiency and excess of these elements result in disturbance of the normal body metabolism. The study was aimed at a determination of the concentrations of some trace elements such as Se, Zn, Cu, and Pb, in polyps and in healthy mucosa. Both the roles and significance of these elements have already been studied in many other diseases, including neoplastic disease (3–8). Trace elements such as Cu, Zn, and Se have a significant influence on the function of the immune system (6,9). Zinc enhances secretion of monokines by monocytes (10). Deficiency of Zn reduces cellular and humoral immunity, inhibits the secretion of antibodies and the proliferation of cells, and reduces the secretion of cytokines (11). Zn and Cu play a specific role in inflammatory processes (12,13). A deficiency of Cu negatively affects the immunological system. Selenium protects the cellular membranes and, similarly to Zn, is an antioxidant. Lead is among the most toxic metals. An excess of Pb influences the activity of many enzymes, impairs cells, and results in swelling of the endothelium of capillary vessels (14,15). Lead reduces the proliferation of cells (16) and might induce autoimmune responses (17).

MATERIALS AND METHODS

The examinations were carried out on nasal polyp tissues taken from 41 patients, including 11 women and 30 men, aged from 14 to 82 years old (on average: 53). Sixteen patients had an allergy confirmed by radioallergosorbent test (RAST) and skin-prick test. The material was obtained during polypectomy procedures. Among the polyps examined there were 24 with infiltration of eosinophil (type I according Pavankar) (18) and 17 with infiltration of neutrophil (type II according Pavankar) species. The parameters examined in the polyp tissue were compared with “healthy” nasal mucosa found in 10 nonallergic patients taken during endonasal surgery and considered as the control group for the whole study.

Levels of Zn, Cu, Pb, and Se were determined by atomic absorption spectrometry. Frozen tissue samples (approx. 0.5 g) were thawed and decomposed with 2 mL concentrated nitric acid (69% HNO₃ for atomic spectroscopy; Spectrosol, England) in a microwave mineralizer in a closed system BM–1z instrument (UniClever; Plazmatronika, Poland). The samples were digested for 15 min at maximum temperature (310°C).

The atomic absorption spectrometric analyses were carried out with a Z-5000 Hitachi instrument, with Zeeman background correction. Copper and Zn were determined with a flame analyzer by atomization in an air-acetylene flame. Lead and Se were determined with a flameless method by electrothermal atomization in a graphite cuvette. For the determination of Pb, 0.5% ammonium dihydrogen phosphate was used as a matrix modifier.