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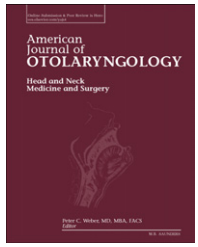

Evaluation of iron and zinc levels in recurrent tonsillitis and tonsillar hypertrophy

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ABSTRACT

Objectives: The aim of this study is to look into the roles of iron and zinc metals in etiopathogenesis of recurrent tonsillitis and tonsillar hypertrophy by evaluating the levels of iron and zinc elements in the palatine tonsillar tissue.

Methods: In total, 40 patients who underwent a tonsillectomy to treat recurrent tonsillitis and tonsillar hypertrophy were included in the study. Patients were classified into two groups, recurrent tonsillitis and tonsillar hypertrophy, determined by the results of clinical and histopathological examination. The levels of iron and zinc elements were determined for each tonsillar tissue sample.

Results: There was a significant difference in the iron and zinc concentrations ($p < 0.001$) between the tonsillar hypertrophy and recurrent tonsillitis groups. The levels of iron and zinc were significantly lower in the recurrent tonsillitis group.

Conclusions: This study suggests that low tissue concentrations of iron and zinc may lead to recurrent tonsillitis.

1. Introduction

Palatine tonsils are the most important constituent of the specialized lymphoid organs located at the upper respiratory tract, which are called the Waldeyer's ring. Infectious and hypertrophic diseases of the palatine tonsils are the pathologies most frequently encountered by ear, nose and throat specialists. As there are authors advocating that tonsillar hypertrophy (TH) and recurrent tonsillitis (RT) are histopathologically different, there are also others subscribing to the opposite opinion [1,2]. As TH and RT are clinically two different entities; in addition to histopathological differences, they were investigated in terms of oxidants–antioxidants, apoptosis and gene polymorphism in different studies [3–6].

Iron is an essential element for the development of the immune system. Iron is the most important component of peroxidase and the enzymes producing nitrous oxide, which are vital for the enzymatic function of immune system cells. Moreover, iron plays a critical role in the regulation of cytokine production and in the development of cellular

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immunity [7]. Zinc has three important biological functions: catalyzer, structural and regulatory; it is one of the most valuable trace elements for the organism. Zinc homeostasis has critical effects on immune function, oxidative stress and apoptosis. Zinc is also essential for the activities of many enzymes including superoxide dismutase, carbonic anhydrase, and matrix metalloproteinases. The levels of iron and zinc in the body have been shown to influence various diseases including malignancies, degenerative diseases and infectious diseases [7–11].

There are a limited number of studies investigating trace elements in tonsillar tissue [12,13]. The aim of this study is to evaluate the levels of iron and zinc elements in the palatine tonsillary tissue and to look into the roles of iron and zinc metals in the etiopathogenesis of RT and TH.

2. Materials and method

2.1. *Subjects*

Forty tonsillar tissue samples obtained from 40 patients, who were operated on for tonsillar disease in the Gaziosmanpaşa University Faculty of Medicine ENT Department were included in the study. The hospital ethics committee approved the study and written informed consent was obtained from the patients after the nature and purpose of the study had been fully explained to them. All experiments were performed according to the Declaration of Helsinki. Tonsillectomy operations were performed using the cold dissection method under general anesthesia on every patient. Following the operation, a tissue sample that contained both core and superficial regions of palatine tonsil was obtained, and stored at –20 °C until the time of analysis. According to their diagnoses, 20 patients were categorized as RT and 20 patients were categorized as TH. Clinical and histopathological parameters were used together for the diagnosis of RT and TH. Patients in whom clinical parameters did not show correlation with histopathological findings were excluded from the study.

2.2. *Clinical evaluation*

Tonsillar size was classified according to the Friedman staging system as stage 1, 2, 3 and 4 [14]. In addition to having stage 3 or 4 tonsillar size, patients who had symptoms of open-mouth breathing during sleep, snoring, and symptoms of obstructive sleep apnea were accepted as TH. In addition to having Friedman stage 1 or 2 tonsillar size, patients with RT had well-documented, clinically confirmed and appropriately treated acute tonsillitis episodes — at least seven episodes in the past year or at least five episodes per year for two years, or at least three episodes per year for three years [15].

2.3. *Histopathological examination*

Tonsillar tissues were transferred to the pathology laboratory in a 10% formalin solution. After routine specimen tracking procedures, tissues were embedded in paraffin. Sections at 4 μm thickness were obtained, and were stained with hematoxlin–eosin and examined under a light microscope.

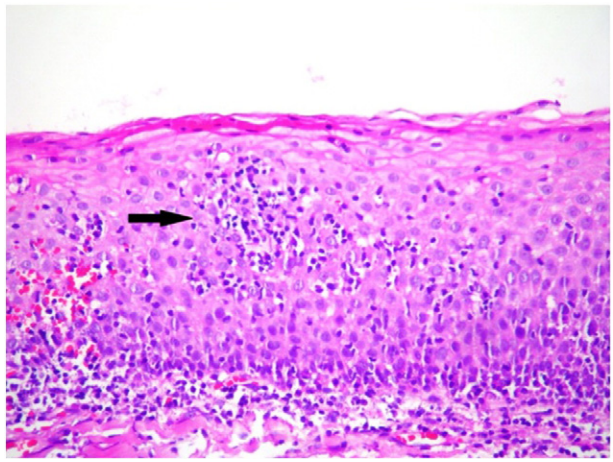

Fig. 1 – Increased number of lymphoid follicular structures in subepithelial stroma.

In the tonsillar tissues, surface epithelia, crypt epithelia and stroma were evaluated histopathologically, and presence of lymphocytes, polymorphonuclear leukocytes, plasma cell infiltration and fibrosis was determined in these areas. According to this evaluation, cases with significant lymphocytic infiltration at the surface epithelium and defects at the surface and crypt epithelia were diagnosed with RT (Fig. 1), whereas those with a prominent increase in lymphoid follicles in the stroma were accepted as TH (Fig. 2).

2.4. *Analytical procedure*

All plastic and glass equipment used in the study were kept in 10% nitric acid solution for 18 h and were properly rinsed out with deionized water. A 1 g sample was obtained from the tonsillar tissue of each specimen. This sample was digested with 3 mL of HNO3 (Suprapure) and 1 mL of H2O2 (Suprapure) in a Milestone Ethos D closed-vessel microwave digestion system for 31 min (the digestion conditions used in the microwave system were 250 W for 2 min, 0 W for 2 min, 250 W for 6 min, 400 W for 5 min, 550 W for 8 min, vent for

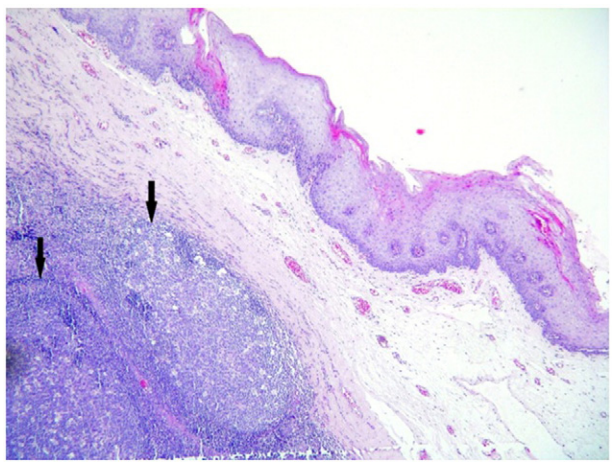

Fig. 2 – Prominent lymphocytic infiltrate at surface epithelium.