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Oxidants and antioxidants in tonsillar and adenoidal tissue in chronic adenotonsillitis and adenotonsillar hypertrophy in children

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KEYWORDS
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Summary

Objective: The aim of the study is to determine the possible role of oxidants and antioxidants in the pathogenesis of chronic adenotonsillitis and adenotonsillar hypertrophy in children.
Patients and methods: The children were divided into infection and hypertrophy groups, which were comparable according to age and gender distribution. The infection group was consisted of 20 children with the diagnosis of chronic adenotonsillitis and the hypertrophy group was made up of 19 childen with adenotonsillar hypertrophy to whom adenotonsillectomy was performed. Preoperative blood levels of erythrocyte MDA, serum MDA, erythrocyte catalase and serum catalase, and adenoidal and tonsillar tissue levels of MDA and catalase were studied.
Results: There were significant increase in tonsil MDA, adenoid MDA, tonsil catalase and adenoid catalase levels in infection group ($p < 0.05$).
Conclusion: Oxidants and antioxidants are found to have an important role in the pathogenesis of adenotonsillar hypertrophy and chronic adenotonsillitis. These findings strengthen the hypothesis that indicates adenotonsillar hypertrophy and chronic adenotonsillitis are different diseases of the same tissues.

1. Introduction

Tonsillectomy with or without adenoidectomy is the most common surgical procedure performed by the Otolaryngologists. Generally, there are two main indications for adenotonsillectomy. The first one is chronic infectious conditions consist of mainly recurrent attacks of acute tonsillitis, chronic tonsillitis with no response to medical treatment associated with halitosis, persistent sore throat or painful cervical adenitis, and tonsillitis with suppurative and non-suppurative complications. The

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second main indication for adenotonsillectomy is the upper airway obstruction associated with significant snoring with open mouth breathing, obstructive sleep apnea or sleep disturbances, speech abnormalities, difficulty in swallowing and breathing, because of enlarged adenoid and tonsils. In fact, chronic adenotonsillitis and adenotonsillar hypertrophy are different diseases of the same tissues with different clinical and histopathological features [1]. Although they are different diseases, there are few reports asking the need for routine histopathologic examinations for adenotonsillectomies except the suspicion of malignancy [2]. The role of free oxygen radicals in the pathogenesis of inflammation is well known. We hypothesis that if chronic tonsillitis and adenotonsillar hypertrophy are different diseases with different clinical and histopathologic features, the oxidant/antioxidant status of children should be also different in these two diseases. This is the first study which compares chronic adenotonsillitis and adenotonsillar hypertrophy by means of oxidants and antioxidants in blood and tissue samples to our knowledge.

2. Materials and methods

The study was performed in the University Hospital of Van, Turkey after institutional ethical committee approval and consent from the parents of children were obtained. The infection group was consisted of 20 children, 11 girls and 9 boys who were planned to go adenotonsillectomy with the diagnosis of chronic adenotonsillitis. The hypertrophy group was made up of 19 children, 9 girls and 10 boys who were planned to go adenotonsillectomy with the diagnosis of adenotonsillar hypertrophy. Both adenotonsillar hypertrophy and chronic adenotonsillitis were diagnosed by history, ENT and radiological examination. Indications other than recurrent attacks of acute tonsillitis, chronic tonsillitis with no response to medical treatment associated with halitosis, persistent sore throat or painful cervical adenitis were not accepted for infection group. Also adenotonsillar hypertrophy leading to excessive snoring with open mouth breathing, obstructive sleep apnea or sleep disturbances, speech abnormalities, difficulty in swallowing and breathing were the indications for surgery in hypertrophy group. According to the assessment scale for tonsillar hypertrophy reported by Brodsky et al. [3] at least stage two tonsils with no history of recurrent infection were included in hypertrophy group. Children who have positive findings for acute otitis media or otitis media with effusion in addition to adenotonsillar hypertrophy were excluded from the study. Adenotonsillectomy was performed to all the patients under general anesthesia. The tissues obtained from the surgery were put into phosphate buffer with 0.1 mM ethylenediaminetetraacetic acid (EDTA), pH 7.0 solution immediately. Preoperatively a total of 10 ml blood was drawn in both groups and 4 ml of serum was collected for malondialdehyde (MDA) and catalase (CAT) measurements. Remaining blood was collected into tubes containing EDTA for the preparation of erythrocytes. Blood was then centrifuged at 2000 rpm for 10 min in a refrigerated centrifuge. Plasma and buff coat were discarded. The cells were washed a cold 0.15 M NaCl solution three times. Prepaparation of washed erythrocytes were done immediately after blood collection from subjects.

The tissues of each subject were removed, cleaned, dried and processed for biochemical measurements. The homogenates were prepared on ice in the ratio of 1:4 (tissue weights:buffer volume (ml)). For each sample 10 μL of 500 mM BHT in acetonitrile was added to prevent of new peroxides during the assay. The homogenates were centrifuged at 10,000 × *g* for 20 min at 4 °C and frozen at −70 °C for one month. For homogenization, 0.1 M phosphate buffer with 0.1 mM EDTA, pH 7.0, was used.

The levels of MDA, an end product of lipid peroxidation, were measured fluorometrically [4] in serum, packed cells and tissue homogenates.

CAT activities were determined by Goth's colorimetric method [5], in which serum, packed cells and homogenate was incubated with H_2O_2 substrate and the enzyme reaction was stopped by the addition of ammonium molybdate. The intensity of the yellow complex formed by molybdate and H_2O_2 was measured at 405 nm. Protein content of homogenates was measured by the method of Lowry [6].

The oxidant and antioxidant levels both in blood and tissue were compared for infection and hypertrophy groups. Results were expressed as mean (x) ± standard deviation (S.D.). Statistical analysis was performed by using Mann−Whitney *U*-test.

3. Results

The infection group was consisted of 20 children, 11 girls and 9 boys aged between 3 and 15 (mean age, 8.2 ± 4.89) and the hypertrophy group was made up of 19 children, 9 girls and 10 boys aged between 4 and 15 (mean age, 9.27 ± 4.38). There were no statistical difference in both age and gender between two groups ($p > 0.05$). Tonsil MDA, adenoid MDA, tonsil CAT and adenoid CAT levels were significantly higher in infection group ($p < 0.05$) (Table 1).