

Evaluation of preoperative and postoperative S-100B levels in children with chronic adenotonsillar hypertrophy: preliminary results

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Abstract. – OBJECTIVES: Upper air obstruction leads hypoxia, it is also known that S-100B levels increase by glial activations indicate cerebral hypoxic injury. This study aimed to evaluate the preoperative and postoperative S-100B levels in children with chronic adenotonsillar hypertrophy.

PATIENTS AND METHODS: The study comprised 40 patients with indications for tonsillectomy and/or adenoidectomy following a diagnosis of chronic adenotonsillar hypertrophy and 40 age-gender matched control patients. Blood samples were taken from the patients preoperatively and at four weeks postoperatively. Preoperative and postoperative serum S-100B levels were analyzed.

RESULTS: The serum S-100B levels in the preoperative period were found to be significantly higher compared to those of the control group ($p < 0.05$). The S-100B levels were significantly decreased in the postoperative period ($p < 0.05$).

CONCLUSIONS: The development of chronic adenotonsillar hypertrophy would play a role in increased S-100B levels. This indicates that neuronal damage would exist in patients with chronic adenotonsillar hypertrophy.

Key Words:

S-100B, Adenotonsillar hypertrophy, Adenoidectomy, Tonsillectomy.

repeated adenotonsillitis, impaired eustachian tube function, repeated otitis media at a level which will cause hearing loss, difficulty in swallowing, breathing difficulties, disturbed sleep and peritonsillar and/ or retrotonsillar apse are the reason for tonsillectomy and/or adenoidectomy to be made by an otolaryngologist^{2,3}.

Although the pathogenesis of developing ATH has not been fully clarified⁴, when there is inflammation and infection, production of free oxygen radicals (ROS) and lipid peroxidation increases⁵⁻⁷. This increase in free radicals and lipid peroxidation causes cell damage⁸. Upper air obstruction leads hypoxia, it is also known that S-100B levels increase by glial activations indicate cerebral hypoxic injury⁹⁻¹². Their levels are increased in cerebrospinal fluid and/or serum in various acute and chronic injuries to the central nervous system¹³⁻¹⁵.

This study aimed to evaluate the preoperative and postoperative serum S-100B levels of patients undergoing tonsillectomy and/or adenoidectomy and to compare the data obtained with those of healthy individuals.

Patients and Methods

This prospective controlled study was conducted at Harran University Medical Faculty, Sanliurfa, Turkey. Prior to subject recruitment, study was granted by the Ethics Committee of Harran University according to the Second Declaration of Helsinki, and written informed consents were ob-

Introduction

Mucosal lymphoid tissue hyperplasia in children because of repeated inflammation and infections results in the development of adenotonsillar hypertrophy (ATH)¹. Associated with this, symptoms such as upper respiratory tract obstruction,

tained from all participants' proxies. From February 2013 to December 2013, consecutively 40 patients with adenoidectomy and/or tonsillectomy patient who were admitted to the pediatric and otolaryngologist polyclinics and who had no exclusion criteria, and 40 age-gender matched control patients were included to the study.

Study patients were divided into two groups: group 1 (n=40) consisted of patients with adenoidectomy and/or tonsillectomy patient, group 2 (n=40) consisted healthy subjects. The control group children comprised who were brought to the general pediatric polyclinic for vaccinations or health examination, and had no history of upper airway obstruction, recurrent adenotonsillitis.

Baseline Definitions

A detailed anamnesis was taken of all the children and their status was determined by physical examination, endoscopic examinations and lateral radiography.

Indications for tonsillectomy were seven or more well-documented, clinically prominent and adequately treated episodes of throat infection during preceding year or recurrent acute tonsillitis for at least 2 years with 5 or more acute attacks per year. Indications for adenoidectomy were obstructive nasal symptoms due to hypertrophic chronic adenoiditis^{16,17}. In all patients, adenoidectomy and/or tonsillectomy was performed by otolaryngologist, using standard surgical techniques under general anesthesia. Tonsillectomy was performed by routine dissection-snare method with general anesthesia under operating room conditions. Adenoid tissue was removed using curettes under indirect mirror visualization. Patients were discharged from hospital on the morning of first postoperative day uneventfully.

Exclusion Criteria

The exclusion criteria were as follows: any cases of metabolic disease; chronic disease (including cardiovascular disorders, malignancy, asthma, allergic rhinitis, cystic fibrosis, renal or liver disease or immunodeficiency); history of asphyxia and; neurological sequel; neurological findings following a seizure with a diagnosis of degenerative and demyelinating disease of the central nervous system.

Blood Samples

Peripheral venous blood samples were taken from patients into empty tubes before adenotonsillectomy and a second sample was obtained in

four weeks postoperatively. In the control group, blood samples from healthy volunteers were collected for one time only. At the start of the study, total blood count, electrolytes, kidney and liver function tests were made by automatic blood count instrument (Cell dyn 3500®) for all the children in the study and control groups. For biochemical analysis, the blood samples taken from the cases selected for research were centrifuged at 3500 rpm for 10 minutes then the formed elements were discarded with the tube and the serum samples were stored at -80°C .

S-100B Assay

Serum S-100B was determined using S-100B protein kits (Roche Diagnostics, Mannheim, Germany) in an autoanalyzer (E-170 Roche®, Germany) using electrochemiluminescence method. The range of this kit was 0.005-0.105 $\mu\text{g/L}$.

Statistical Analysis

Data were analyzed using SPSS (Statistical Package for the Social Sciences, version 17 for Windows, SPSS® Inc, Chicago, IL, USA). Distribution of variables was assessed with One-Sample Kolmogorov-Smirnov test and all variables were found to be normally distributed. The results were presented as mean \pm standard deviation. Demographic data was performed using Chi-square test. Independent Samples t test was used to compare data among groups. Paired t test was used to detect differences between preoperative and postoperative periods. A two-tailed p value ≤ 0.05 was considered statistically significant.

Results

The 40 patients included in the study were 19 (47.5%) male and 21 (52.5%) female, with a mean age of 7.92 ± 3.17 years. The control group of 40 healthy individuals was composed by 22 (55%) males and 18 (45%) females with a mean age of 7.90 ± 2.80 years. No statistically significant difference was found between the two groups in terms of age or gender ($p > 0.05$) (Table I).

The preoperative mean S-100B levels of the patients were found to be statistically significantly higher compare to the mean S-100B levels of the control group ($p = 0.04$) (Table I). The postoperative mean S-100B levels were compared with the preoperative values, and the S-100B levels were found to be statistically significantly lower ($p = 0.002$) (Table II, Figure 1).

Table I. The demographical and S-100B levels of the study groups.

	Group 1 (n=40)	Group 2 (n=40)	<i>p</i>
Gender (M/F)	19/21	22/18	0.65
Age (year)	7.92 ± 3.17	7.90 ± 2.80	0.97
S-100B (µg/mL)	0.42 ± 0.26	0.27 ± 0.17	0.04

Discussion

To the best of our knowledge the current study is the first in literature that evaluated the serum S-100B levels in patients with ATH, and the main

Table II. The preoperative and postoperative S-100B levels in adenotonsillary hypertrophy patients.

	Preoperative period (n = 40)	Postoperative period (n = 40)	<i>p</i>
S-100B (µg/mL)	0.42 ± 0.26	0.23 ± 0.23	0.002

findings are as follows: (1) preoperative S-100B levels were significantly higher than healthy subjects; (2) postoperative S-100B levels were decreased in patients with ATH.

S-100 proteins, small-molecular-weight calcium-binding proteins and with three known subtypes consisted of a dimeric combination of the α- and β-chain. S-100 B to the brain-specific one. This protein can be found in the cytoplasm of astroglia and Schwann cells but also found in non-neuronal cells such as adipocytes, chondrocytes and melanoma cells¹⁸. Extracellular functions of S-100B are especially prominent to understanding the potential role of this protein in modulating neuropathological outcomes after brain injuries. Increased production of S100B through glial activation (reactive gliosis) and/or lesion may explain a number of studies proposing that S-100B could be a diagnostic and/or prognostic marker in brain injury assessment^{13,19}. Their levels are increased in cerebrospinal fluid and/or serum in various acute and chronic injuries to the central nervous system. Upper air obstruction leads hypoxia, it

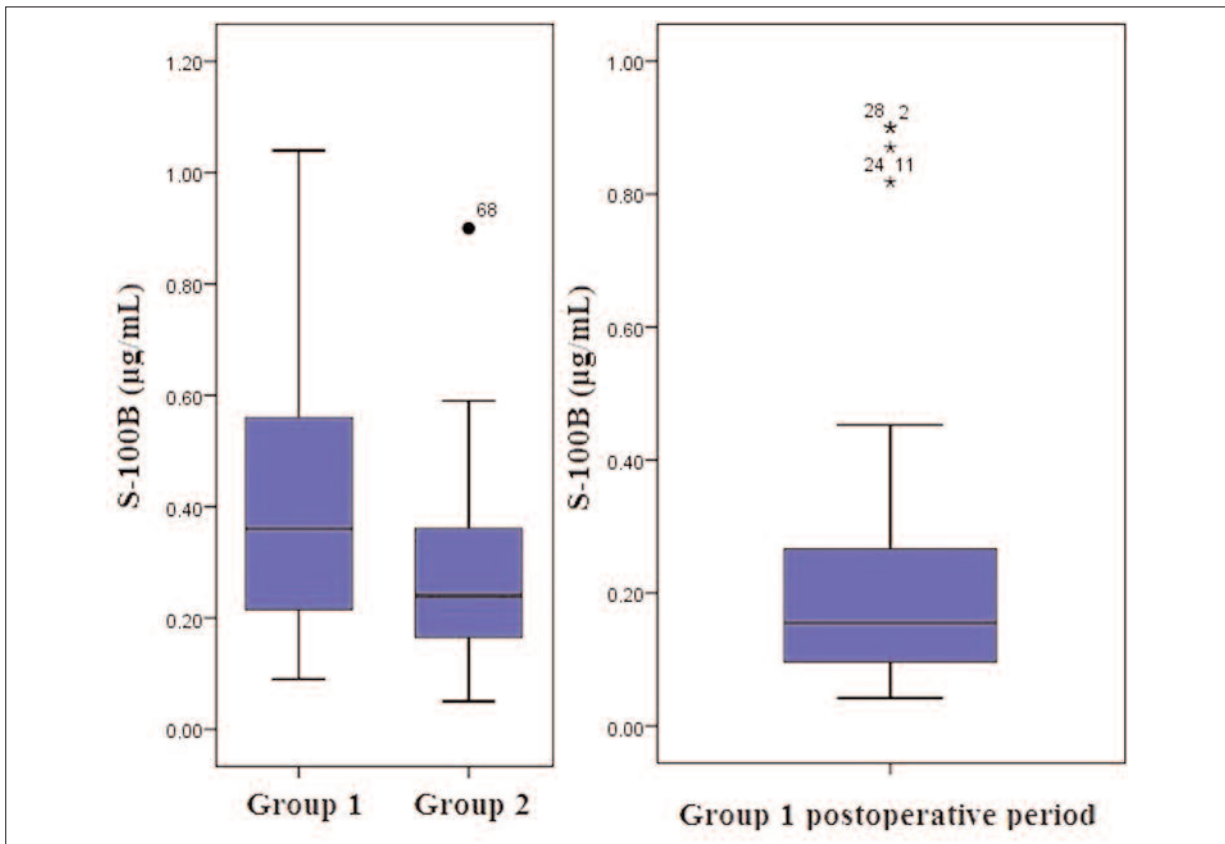


Figure 1. Graph demonstrating the preoperative and postoperative S-100B levels.

is also known that S-100 B levels increase by glial activations could indicate cerebral hypoxic injury^{9,13-15}.

In literature, S-100B levels were investigated in several clinical trials. Increased serum or cerebrospinal fluid S-100B levels compared to the healthy controls have been shown in traumatic brain injury^{18,20}, stroke²¹, subarachnoid hemorrhage²², schizophrenia²³, patients with bacterial meningitis²⁴⁻²⁶, hypoxic-ischemic encephalopathy and premature infants with intraventricular hemorrhage²⁷, patients with epilepsies²⁸⁻³⁰. In our study, preoperative serum S-100B levels were found to be higher in patients with ATH than those of the controls, and S-100B levels were decreased in the postoperative period.

Conclusions

These findings revealed that S-100B levels would be a marker for demonstrating the occult brain injury in patients with ATH due to the chronic obstruction of the airway. Namely, this indicates that neuronal damage would exist in patients with chronic ATH. The sample size in this study is relatively small; therefore multicenter prospective cohort studies are needed to clarify this issue.

Conflict of Interest

The Authors declare that there are no conflicts of interest.

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