

IgM, IgG, IgA Serum Levels and Lymphocytes Count Before and After Adenotonsillectomy

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ABSTRACT

Background: Tonsils and adenoids are involved in both local immunity and immune surveillance for the development of immune defense mechanisms. A number of investigators have found decreased immunoglobulin levels after adenotonsillectomy while others have failed to find significant changes. The effects of adenotonsillectomy on the cellular immunity of children have not been investigated extensively. **Objective:** To observe the change in humeral and cellular immune systems before and after operation in patients undergoing adenotonsillectomy. **Methods:** The study comprised 102 patients; all of the patients underwent adenotonsillectomy. The levels of IgG, IgA, and IgM were measured for humoral immunity and the percent of CD7 and CD19 positive cells were determined in blood samples taken from these patients 24 hours before operation and also 2 and 8 weeks after the operation. The results were subjected to statistical analysis. **Results:** The present study shows that the serum level of IgA would rise few weeks after the operation. Changes in the IgM and IgG level were not statistically significant postoperatively. In addition, no significant change was detected in B lymphocyte count before and after adenotonsillectomy. In our study, there was a slight decrease in the T lymphocyte count in the early stage of post operation, which returned to normal preoperative value after 8 weeks. **Conclusion:** Several immune system parameters maintain its normal status several weeks after adenotonsillectomy.

Keywords: Tonsil, Lymphocytes, IgM, IgG, IgA

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INTRODUCTION

Tonsils and adenoids are the largest components of Waldeyer's ring, represent the first site of contact with a variety of microorganisms and other antigenic substances present in food, and inhaled air (1). Tonsils and adenoids apparently play an important immune-inductive role as components of mucosa-associated lymphoid tissue (MALT). These structures also show similarities with lymph nodes and may in addition participate as effector organs of the local systemic-type as well as mucosal-type of adaptive immunity (2).

Tonsillar diseases are among the most commonly encountered health-related problems in the general population. The choice of treatment is often tonsillectomy. The criteria for tonsillectomy and the effect of tonsillectomy on the patients' immunological integrity are widely debated (3). Tonsillectomy is one of the most common procedures carried out by otolaryngologists and accounts for around 20% of the operations they perform (4). Tonsillectomy with or without adenoidectomy has long been one of the most frequently performed surgical procedures in children (5).

The purpose of this study is to observe the change in humeral and cellular immune systems before and after operation in patients undergoing adenotonsillectomy.

MATERIALS AND METHODS

The study comprised 102 patients, with diagnosed hypertrophy of tonsils and adenoids or recurrent adenotonsillitis in the department of otolaryngology head and neck surgery, Dastghaib Hospital of Shiraz University of Medical Sciences from June 2004 to September 2005. All of the patients underwent adenotonsillectomy. The indication of operation was at least five repeated attacks of tonsillitis in the last two years and snoring due to adenoid hypertrophy.

The surgery was conducted under general anesthesia with orotracheal intubation. Surgeries were all conducted by the same surgeon.

Samples were taken from patients 24 hours before operation, 2, and 8 weeks after operation. The percentage of CD7 positive cells (T lymphocyte) and CD19 positive cells (B lymphocyte) were determined by immunofluorescent assay (IFA) test and serum levels of IgG, IgA, and IgM were measured using standard nephelometric technique and the single radial immunodiffusion (SRID) method.

For IFA test, specific monoclonal antibodies for CD7 and CD19 (DAKO, Denmark) were used. Briefly, PBMCs (Peripheral Blood Mononuclear Cells) were isolated by the standard technique, using lymph prep (NY Comed pharma, Oslo-Norway) gradient centrifugation. The isolated cells were washed and resuspended in PBS at a density of 1×10^5 cells per ml. Isolated MNC (Mononuclear Cells) were incubated with the above mentioned monoclonal antibodies separately for 30 minutes. Fluorescein-conjugated f(ab)² fragment of rabbit or anti-mouse IgG (DAKO, Denmark) was used as second antibody. The results were analyzed under a fluorescence microscope. One hundred cells were counted per slide and the percentage of positive cells was calculated.

The tests were repeated three times, before adenotonsillotomy, 2 and 8 weeks after operation. The results were subjected to statistical analysis. Student's t-test for paired data was used to analyze the change within groups. Correlations were tested by linear regression analysis. P-values less than 0.05 were considered significant.

RESULTS

A total of 102 patients referred for adenotonsillotomy (54 girls and 48 boys), aged from 2 to 15 years (mean age 6.5 year). We measured the serum level of IgM, IgG, and IgA before operation in patients with adenotonsillar hypertrophy (Table 1). There was no statistically significant difference between age groups and sex of patients.

Two weeks after adenotonsillectomy, the serum level of IgA increased which was statistically significant ($p < 0.01$). In addition, we observed an increase of the serum level of IgM and a decrease in the IgG level, but they were not statistically significant, compared with preoperative measures. Eight weeks after the operation, the serum level of IgA decreased to preoperative value ($P < 0.01$). In addition, there were an increase of the serum level of IgM and a decrease in IgG level, which was not statistically significant, compared to preoperative measures (Table 1).

Table 1. The serum level of IgA, IgG and IgM before (first test) and after (second and third test) in patients undergoing adenotonsillectomy

Antibody	First Test Mg/ml	Second Test Mg/ml	Third Test Mg/ml	Normal Mg/ml
IgM	2.65±1.4	2.73±1.4	2.93±1.4	1.5
IgG	8.28±1.6	8.04±1.7	8.14±2.6	13.5
IgA	2.92±1.5	3.61±1.6	2.69±1.6	3.5

The percentage of B lymphocyte count was found to be normal in patients preoperatively. There was a slight decrease after the surgery, but it was not statistically significant. The percentage of T lymphocyte count was normal in patients preoperatively, but we found a slight decrease in the T lymphocyte count in the 2nd test and an increase to preoperative range in the 3rd test ($P < 0.02$) (table 2)

Table 2. The percentage of T (CD7 positive) and B (CD19 positive) lymphocytes before (first test) and after (second and third test) in patients undergoing adenotonsillectomy

Lymphocyte	First test %	Second test %	Third test %	Normal %
B cell	20±7	18±8	18±5	10-15
T cell	62±10	58±11	60±8	70-75

DISCUSSION

Although tonsils and adenoids apparently play an important immune-inductive role as components of mucosa associated lymphoid tissue (MALT), these structures show similarities with lymph nodes. Tonsils and adenoids contain four specialized lymphoid compartments participating in immune function of these organs, namely the reticular crypt epithelium, the extrafollicular area, the mantel zones of lymphoid follicles and the follicular germinal center (2).

Several researchers have found decreased immunoglobulin levels after adenotonsillectomy while others have failed to find significant changes. The effects of adenotonsillectomy on the cellular immunity of children have not been investigated extensively. (1)

The results of the present study have shown that the serum level of IgA after operation has risen. Changes in the IgM and IgG level were not statistically significant postoperatively. Also no significant change was detected in B lymphocyte count before and after adenotonsillectomy. In our study, there was a slight decrease in the T lymphocyte count in the early stage post operation, which returned to normal preoperative value after 8 weeks.

In a study by Gogi et al. (6), no significant change was found in the serum immunoglobulin after adenotonsillectomy, compared with preoperative values. Also Redondo et al (7) and Ikinçioğullari et al. (1) in their research have found a slight but not significant decrease in IgG level while Friday et al. (8) have detected a decrease in IgG levels after operation. The result of the present study was similar to Redondo et al. (7) and Ikinçioğullari et al. (1) studies on IgG level. Cantani et al. (9) and Bock et al. (10) in different studies have found a decrease in the IgA level after operation. Also our study revealed that there was a significant increase in IgA level two weeks after the operation, but IgA level in the third test (8 weeks after surgery) was the same as the above studies. Investigations by Bussi et al. (11) and Bock et al. (10) have shown an increase in T and B cell numbers after the surgery. Ikinçioğullari et al. (1) found an increase in T and B cells count but finally B cell numbers returned to normal numbers.

We did not find any statistically significant decrease in B cell numbers after surgery similar to Ikinçioğullari et al. (1) study. We found a slightly decrease in the T lymphocyte count in the second test and an increase to the preoperative range in third test. Therefore, our result was somewhat different from the above researches.

We suggest further B and T cell analyzing by flow cytometry. Besides studying the count of B and T cells after adenotonsilectomy, evaluating lymphocyte functional activity is also recommended.

In conclusion, in spite of several previous studies about the effect of adenotonsillectomy on the immune system, there is still a gray area and no definitive evidence to convince that this common operation has an adverse effect on immune system. Overall, the results of this study point to the fact that the immune system maintains its normal status several weeks after adenotonsillectomy.

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