CHANGES IN IMMUNOGLOBULIN LEVELS FOLLOWING
ADENOIDECTOMY AND TONSILLECTOMY

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ABSTRACT

Introduction: Lymphoid tissue from waldeyer's ring produces all types of immunoglobulins, mainly G and A, and between 4 to 10 years, of age. In other words, the age in which the adenoid and tonsillar surgery is carried out. Our study tries to analyze the impact of the tonsillar surgery on the serum levels of immunoglobulins. Material and methods: We present a prospective study with 89 healthy children aged between 4 to 10 years. Immunoglobulin G, A and M levels were measured preoperatively, at a month and at four months after adenoidectomy and/or tonsillectomy.

Results: Serum IgG levels dropped after surgery, but partially recovered four months later. IgA dropped less significantly and IgM did not change its levels. No one of the studied immunoglobulins dropped below the normal serum levels.

Discussion/Conclusions: Adenoid and tonsil ar surgery cause a fall of postoperative immunoglobulin G and A serum levels, partiallyne recovering after four months. Serum levels never dropped below normal levels, and of the studied children suffered a postoperative disease due to immunodeficiency.

KEY WORDS: Immunoglobulins. Tonsillectomy. Adenoidectomy.
INTRODUCTION

The lymphoid organs of Waldeyer’s ring, mainly the palatine tonsils and the pharyngeal tonsil or adenoids, are the first immunocompetent tissue that contact exogenous microorganisms. The tonsils produce immunoglobulins from the fetal stage, although they do not acquire important levels until birth. They produce all types of immunoglobulins, but mainly IgG and IgA. The main immunological activity takes place between 4 and 10 years of age, decreasing after puberty, even though a considerable activity may continue in adulthood. The maturation of the tonsils and the external antigenic stimulus have been proven to be the main factors of such increase in the activity. The effect that chronic tonsilitis has in the production of all types of immunoglobulins in saliva and serum has also been studied. The variations in the serum immunoglobulin levels is a classic cause of controversy, changes after surgical treatment (adenoidectomy and tonsillectomy) have been found in patients with IgA-glomerulonephritis and in those who have had the polio vaccination. One aspect in which all the diverse studies still show discrepancies is in the postoperative levels of serum immunoglobulins in healthy children. While the majority of authors affirm insignificant reductions in serum levels of immunoglobulins, others point out changes in these levels that can affect the immunity of the child, conditioning the classic indications of adenotonsillectomy.

The objective of our study is to determine the impact of tonsillectomy on serum immunoglobulin levels in a sample of healthy children that have been operated on.

MATERIAL AND METHODS

We have carried out a prospective study in healthy children proposed for adenoidectomies and adenotonsillectomies aged between 4 and 10 inclusively. Those with a concomitant pathology were excluded as this could alter immunoglobulin levels. The criteria for surgery was acute recurrent infections or lymphoid hypertrophy causing important airway obstruction. Serum levels of immunoglobulin G, A and M were measured prior to the operation, as well as a month and four months following the operation. The parents or guardians were informed and gave their verbal consent for the children to be included in the study. The study began with 120 cases, all of which had their preoperative serum immunoglobulin levels measured. Of the 120, 89 completed the study having their immunoglobulin levels measured one month and four months after the operation, losing the remaining 31 who are not included in the results.

The nephelometry technique was used to measure serum immunoglobulin. Nephelometry measures light intensity dispersed by the immunoglobulin-antibody precipitate through the serum. The measurement is proportional to the concentration of Ig and is done with a known standard concentration. The serum is obtained from a vein using gelose tubes. The analysis was carried out using the BN II, Dade Behring nephelometer.

The data was analyzed statistically using the program SPSS, user version 6.0.1 to find the average and standard deviation.

RESULTS

Immunoglobulin levels were measured in a total of 89 healthy children divided into two groups: 47 who had an adenotonsillectomy and 42 who had an adenoidectomy. The average age was 5.65 years, higher in the group that only had the adenoids removed (6.19 years) than in adenotonsillectomy group (5.17 years). The distribution in male and female was same in both groups: 59.6% men and 40.4% women.

The IgG results, show the initial level to be 1005.98 mg/dL with a statistically significant difference between males (an average of 967.35) and females (an average of 1061.65). A drop in the level happened one month after surgery with an average of 939.44 mg/dL. The average recovery four months later is 954.67. A statistically significant difference exists between patients who only have an adenoidectomy, whose levels dropped more than those that underwent adenotonsillectomy. In none of them the level dropped below the minimum level considered normal (700 mg/dL).

IgA levels, dropped after surgery to an average of 1056.76 mg/dL a month after the operation and to 1051.65 four months after, but always above the value considered normal (70mg/dL). A statistically significant difference exists between patients who only have an adenoidectomy, whose levels dropped more than those that underwent adenotonsillectomy. The adenoidectomy patients also recovered the levels in a lower proportion. In none of them the level dropped below the minimum level considered normal (700 mg/dL).

IgA levels, dropped after surgery to an average of 112.18 mg/dL a month after the operation and to 105.61 four months after, but always above the value considered normal (70mg/dL). In this group we have found a difference between those patients who had an adenoidectomy, whose levels practically did not vary, to those who had double
We obtained an initial value of IgM of 103 mg/dL falling to 98.4 mg/dL immediately after the intervention and recovering four months later to an average of 102.8 mg/dL (Table 3, Figure 3). We have found differences according to the type of intervention, and according to sex. Men experienced a more noticeable drop in their averages (from a preoperative 97.04 to 86.69 a month later) than females, whose levels changed less dramatically (from a preoperative level of 111.76 to 111.17 a month after treatment). None of these differences is statistically significant. The average values were always found to be above the figure considered normal; some 50mg/dL.

A follow-up a year after the intervention, showed that none of the patients experienced higher infective processes in the upper respiratory tract or immunodeficiency related diseases.

**DISCUSSION**

The role of the lymphoid tissues of Waldeyer's ring in the production of immunoglobulins and lymphocytes is well-known. Many studies have demonstrated that the production of IgG and IgM increases when in

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**Table 1: Serum IgG measurements.**

<table>
<thead>
<tr>
<th>Type of surgery</th>
<th>Preoperative</th>
<th>After 1 month</th>
<th>After 4 months</th>
</tr>
</thead>
<tbody>
<tr>
<td>Adenoidectomy</td>
<td>1,001.85</td>
<td>913.14</td>
<td>921.93</td>
</tr>
<tr>
<td>Adenotonsillectomy</td>
<td>1,010</td>
<td>958.48</td>
<td>978.04</td>
</tr>
<tr>
<td>Total</td>
<td>1,005.98</td>
<td>939.44</td>
<td>954.67</td>
</tr>
</tbody>
</table>

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**Table 2: Serum IgA measurements.**

<table>
<thead>
<tr>
<th>Type of surgery</th>
<th>Preoperative</th>
<th>After 1 month</th>
<th>After 4 months</th>
</tr>
</thead>
<tbody>
<tr>
<td>Adenoidectomy</td>
<td>113.15</td>
<td>113.19</td>
<td>116.20</td>
</tr>
<tr>
<td>Adenotonsillectomy</td>
<td>146.64</td>
<td>111.45</td>
<td>98.14</td>
</tr>
<tr>
<td>Total</td>
<td>130.09</td>
<td>112.18</td>
<td>105.67</td>
</tr>
</tbody>
</table>

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**Table 3: Serum IgM measurements.**

<table>
<thead>
<tr>
<th>Type of surgery</th>
<th>Preoperative</th>
<th>After 1 month</th>
<th>After 4 months</th>
</tr>
</thead>
<tbody>
<tr>
<td>Adenoidectomy</td>
<td>105.07</td>
<td>92</td>
<td>100.6</td>
</tr>
<tr>
<td>Adenotonsillectomy</td>
<td>101.12</td>
<td>103.1</td>
<td>104.43</td>
</tr>
<tr>
<td>Total</td>
<td>103.07</td>
<td>98.4</td>
<td>102.8</td>
</tr>
</tbody>
</table>
contact with external pathogens, mainly bacteria, showing high levels basal IgG in patients with chronic adenotonsillitis, mainly for *Haemophilus influenzae* and *Streptococcus pneumoniae*1,8,14,15. The increase of IgA in serum and saliva is also a common finding1,16. A drop in serum immunoglobulin levels and in secretory IgA16,19 in patients who have had a tonsillectomy6,8,15-18 has been noticed, with a more or less rapid postoperative normalization. Some authors have presented studies in which humoral levels barely vary20. There are also in vitro studies that show an increase in the production of immunoglobulins following a tonsillectomy, meaning a stimulating effect on immunity21.

Other chronic infection markers also vary. In patients with chronic adenotonsillitis, the lymphocytes CD19+6 increase. Following a tonsillectomy, lymphocytes CD21+ also increase slightly18.

The role of the tonsillectomy in children with IgA dependent glomerulonephritis is well known. A drop in serum levels following the intervention has been confirmed, with an improvement of all urinary parameters in half of the cases, although the intervention is contra-indicated if kidney damage is clinically obvious4,5.

However, in the 1980s and 1990s, some studies suggested that the drop of immunoglobulins in serum or saliva could be greater than was believed, either without clinical symptoms 10 or with risk of respiratory postoperative infection9,12,13, although other studies deny this18.

This controversy has not been resolved yet. In our study we wanted to collect in vivo data of pre- and postoperative immunoglobulin levels in healthy children and if changes in these levels can have an influence on the immune system of the respiratory tract. First of all we have confirmed that the average level never dropped below normal value. There has not been any complications in the children that stayed until the end of the study neither in the short-term follow-up (7 months) that followed. These complications, in the case of an IgG deficiency are: pyogenic and recurrent infections and telangiectatic infections. In the case of an IgA deficiency: respiratory tract infections, otitis, atopic allergies, autoimmune diseases and a risk of neoplasia. The IgM deficiency could mean meningitis, septicemia, recurrent otitis and respiratory tract infections.

Serum levels of IgG were the ones more affected after surgery, showing a drop a month after the intervention and partially recovering 4 months later, similar in magnitude and type of curve to other studies. The most apparent difference, in our study as compared to others, has been a more pronounced drop and a lower recovery than IgG figures in patients who only had an adenoidectomy as compared to those who had adenoids and tonsils, with a statistically significant result of p<0.1. In theory, the removal of the palatine tonsils, main producers of IgG, should have a greater effect on serum levels, in the same way Redondo et al2 claim. However, in our study, the opposite phenomenon was seen, without us being able to provide a clear explanation as to why, although could be due to the difference in the average age (more than a year) between the adenoidectomy and the adenotonsillectomy groups. It is also possible that a longer follow-up could show similar figures to other studies. In any case, the tonsils do not seem to be so important to serum levels of IgG as was postulated at the beginning.

Serum IgA concentrations experienced a gentle drop straight after surgery that lasted 4 months, always above normal threshold. In our study this decrease only happened in patients who had the double operation; although conclusions cannot be drawn from the results as they were not statistically significant, not forgetting the influence that the age difference between the groups could have.

The serum IgM levels, coinciding with other studies, did not show any variation after surgery. In conclusion we can say that the adenoidectomy and adenotonsillectomy interventions produce a drop in serum IgG and IgA levels but never below the levels considered normal. Furthermore, the IgG levels partially recovered after four months. None of the patients in the study had complications from the surgery even a year later (recurrent upper airway infections, opportunistic infections, immunodeficiency related diseases).

Serum IgM levels barely varied with the intervention, confirming the small secretion from the pharyngeal lymphoid tissue.

Although we believe that the results from our study are enough to state that the adenoidectomy or the adenotonsillectomy do not modify the immune system, we think that a further study should be designed with groups of same age and gender to see any differences between the simple adenoidectomy and the adenotonsillectomy.
REFERENCES


