ORIGINAL ARTICLE

Effect of tonsillectomy on humoral immune system in children

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Abstract

Background: ***Tonsillectomy is one of the surgical operations that is performed the most frequently all over the globe. For a long time, tonsil surgery has been restricted to only partial excision because of the concern that it might remove vital tissue.***

Aim: ***To study the impact of tonsillectomy on the humoral immune functions of kids regarding the concentrations of certain immunoglobulins (IgA, IgG, and IgM).***

Patients and methods: ***This was prospective comparative research performed on 60 cases from Al-Azhar university hospitals who indicated tonsillectomy.***

Results: ***The mean age of cases was 7.75 ± 2.36 years, with twenty-nine (48.3 %) being male and thirty-one (51.7 %) being female. Statistically insignificant variation has been seen among before and following surgery IgA levels in the examined group. A statistically insignificant variation has been seen among before and following surgery IgM levels in the examined group. Statistically insignificant variation has been seen among before and following surgery IgG levels in the examined group.***

Conclusion: ***The findings of this investigation indicated a statistically insignificant distinction that had been observed in prior and following surgery levels of IgM, IgG, and IgA in the studied group.***

Keywords: Tonsillectomy; Immune System; IgM

1. Introduction

Tonsillectomy is one of the most prevalent surgical operations globally. Historically, tonsillectomy has been restricted to partial excision for concerns about maintaining healthy tissue. The credit for the first full tonsillectomy is attributed to Celsus in the first century. As treatment gained popularity, partial excision remained regarded as the safest and most effective way for excision. By the nineteenth century, enhanced illumination, improved hemostatic control, and advanced anesthetic procedures facilitated full excision. [1]

The adenoids, palatine tonsils, tubal tonsils, and lingual tonsils constitute the lymphoepithelial tissues forming Waldeyer's ring, named after the German anatomist Heinrich Wilhelm Gottfried von Waldeyer-Hartz. These organisms constitute the immune system of the mucosa. Their main role is to take part in the secondary immune system by local pathogens and immunological sampling antigens. They are deliberately positioned at the junction of the respiratory as well as digestive processes to function as a site for continued lymphoid stimulation. [2]

The palatine tonsils generate antibodies through their B cells. Tonsillar growth peaks between four and seven years of age, with involution commencing by fourteen years, leading to minimal lymphoid tissue by sixty years old. [3]

The purpose of this research was to study the impact of tonsillectomy on the humoral immune functions of children regarding the concentrations of certain immunoglobulins (IgM, IgG, and IgA).[3]

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2. Patients and methods

This was prospective comparative research performed on 60 cases from Al-Azhar university hospitals who indicated for tonsillectomy. The duration of the study was 12 months, from November 2023 to November 2024.

Inclusion criteria: Age: ranged from 3 to 16 years, sex: both females and males have been involved and children who indicated for tonsillectomy.

Exclusion criteria: Age: over 16 years old or fewer than 3 years old, cases with unilateral tonsillar mass (tumor), children who were immunocompromised (Diabetes mellitus – steroid intake) and children had bleeding disorders.

Methods

All patients in this research have been exposed to the following: Full history taking ,general examination and nasal examination ,ear examination, oral cavity examination: ensure that there was no acute attack of tonsillitis or postnasal discharge and no signs of quinsy and Preoperative measurement of (IgG- IgM -IgA) levels, CBC, ESR, ASOT, PT, PTT, INR and RBS within one month before operation ,children underwent tonsillectomy operation ,postoperative measurement of (IgG- IgM -IgA) levels after one month and the results of (IgG- IgM -IgA) levels pre-operative and post-operative after one month were compared.

The risks to participants and measures used to minimize the risk: Any unexpected risks that occurred throughout the research were immediately notified to participants and the ethics committee. Informed permission has been acquired in writing from all research participants. The Ethics Committee of the Faculty of Medicine of Al-Azhar University permitted the research. Provisions are in place to ensure participant privacy and data confidentiality as follows: Each participant is assigned a code number, while their name and address are stored in a secure file. We concealed the case's identity during the research. We utilized the research's outcomes just for scientific analysis and didn't use them for any other objectives.

Statistical analysis

The data analysis has been conducted with SPSS (Statistical Package for the Social Sciences): Characterization of quantitative variables through mean, SD, and range. Qualitative variables are described using counts and percentages. Analysis of variance (ANOVA) for the comparison of many groups exceeding two. The Spearman rank correlation test had been applied to examine the potential association among two variables, with a positive correlation or an inverse association indicated by a value more than 0.05 as insignificant, less than 0.05 as significant, and less than 0.01 as highly significant.

3. Results

Table 1 shows that the mean age of patients was 7.75± 2.36 and 29 (48.3%) of cases were males while 31 (51.7 %) were females.

Table 1. Distribution of baseline characteristics in the examined group.

	STUDY GROUP (N= 60)
AGE (YEARS)	RANGE: 3 - 16
MEAN± SD	7.75± 2.36
SEX	
MALE	29 (48.3%)
FEMALE	31 (51.7%)

Table 2 shows that there was no statistically significant difference between pre and post-operative IgA in the studied group.

Table 2. Distribution of pre and post-operative IgA in the studied group.

	PRE-OPERATIVE (N= 60)	POST-OPERATIVE (N= 60)	P-VALUE
IGA			
MEAN± SD	156.73±81	156.31±79.98	0.977

P value >0.05: Not significant, P value <0.05 is statistically significant, p<0.001 is highly significant., SD: standard deviation.

Table 3 shows that there was no statistically significant difference between pre and post-operative IgM in the studied group.

Table 3. Distribution of pre and post-operative IgM in the studied group.

	PRE-OPERATIVE (N= 60)	POST-OPERATIVE (N= 60)	P-VALUE
IGM			
MEAN± SD	128.91± 51.97	128.18±44.13	0.934

Table 4 shows that there was no statistically significant difference between pre and post-operative IgG in the studied group.

Table 4. Distribution of Pre and post-operative IgG in the studied group.

	PRE-OPERATIVE (N= 60)	POST-OPERATIVE (N= 60)	P-VALUE
IGG			
MEAN± SD	1200.7±170.09	1167.05±176.95	0.290

4. Discussion

It is generally agreed that tonsils are essential parts of the system that defend the body against pathogens that enter the upper respiratory tract from the outside. The human tonsils, which are components of Waldeyer's ring, are lymphoid organs that are immunologically active. They create specific antibodies and exhibit B- and T-

cell action in response to a variety of antigens. As a result, they play roles in both humoral and cellular immunity.[4]

Human immune responses are categorized into 2 types: (a) humoral immune response, reliant on antibodies, plasma cells, and B cells, and (b) cellular immunological response, reliant on cytokines and T cells. Lymphocytes are the essential cells in the immune system. All lymphocytes originate from a similar lymphoid progenitor cell in the bone marrow, subsequently migrating to peripheral lymphatic tissues.[5]

Our investigation indicated that the mean age of cases in the examined group was 7.75 ± 2.36 years, with twenty-nine (48.3%) being male and thirty-one (51.7%) being female.

This investigation aligns with research conducted by Mohamdy et al.[6] who aimed to examine the impact of tonsillectomy on humoral immune markers (IgM, IgA, and IgG) in children suffering from obstructive sleep apnea, both before and following surgery.

Sixty cases scheduled for tonsillectomy, diagnosed with adenotonsillar hypertrophy by otorhinolaryngology surgeons based on clinical findings, have been involved. A total of sixty kids participated in the research; twenty-one of them were lost to follow-up three months following surgery, leaving just thirty-nine kids who completed the research. There were twenty-one females (53.8%) and eighteen males (46.2%), all aged up to three years of age.

Moreover, our outcomes align with those of Elmagd et al.[7] who aimed to examine the alterations in humoral and cellular immunity in kids aged between the ages of eight and fifteen with chronic tonsillitis, both prior to and one month after tonsillectomy. The investigation involved thirty kids, comprising sixteen females and fourteen males, aged between eight and fifteen years, with a mean age of 11.5 ± 4.9 years.

Moreover, our results align with those of Radman et al.[8] who aimed to examine the impact of long-term tonsillectomy on cases' immune systems. The case-control research assessed the immune system health in thirty-four kids' post-tonsillectomy. The average age in the case group was 12.35 ± 1.57 years. Gender analysis of the two groups revealed fifteen males (44.11%) and nineteen females (55.89%) in the case group.

Additionally, Kaygusuz et al.[9] aimed to examine the long-term impacts of tonsillectomy in relation to their short-term findings. Among thirty-seven kids, there were twenty-one girls and sixteen boys, aged from five to nine years, with a mean age of 7.29 ± 2.6 years.

The current investigation indicated that a statistically insignificant variation has been observed in the distribution of before and following surgery IgA among the examined group (P-value more than 0.05).

This outcome was consistent with the findings of Santos et al.[10] who aimed to investigate both long- and short-term influences of tonsillectomy on the humoral and cellular immunity of kids. This continuous prospective research involved twenty-nine kids referred for adenotonsillectomy, revealing statistically insignificant variation in prior to and following surgery IgA levels within the examined group.

Furthermore, our results align with those of Altwairqi et al.[11] who demonstrated an insignificant variance in humeral immune indicators (IgA) before and after surgery.

Conversely, an investigation by Mohamdy et al.6 indicated that the IgA level has been diminished in one- and three-month postoperative follow-up evaluations compared to the prior surgery level (P-value less than 0.001).

In contrast to the current findings, Dai et al.[12] aimed to examine the alterations in the cellular and humoral immunity of kids. It was observed that IgA levels one-month post-surgery were considerably lower than pre-operative levels; these levels reverted to baseline three months following the surgery. The alterations were statistically significant (P-value less than 0.01).

The current investigation revealed statistically insignificant variations between pre-operative and following surgery levels of IgA, IgM, and IgG within the examined group (P-value over 0.05).

Our results align with those of Altwairqi et al.[11] who demonstrated an insignificant variation in the levels of humeral immune marker antibodies (IgM and IgG) before and after surgery.

Likewise, the present investigation aligns with the findings of Santos et al.[10] who determined that a statistically insignificant variation has been observed in prior and following surgery IgG and IgM levels within the examined group.

Conversely to our findings, Kaygusuz et al.[9] showed statistically significant variations among prior to and following surgery levels of IgG and IgM, which diminished one-month post-surgery (P-value less than 0.05).

In contrast to the current findings, Mohamdy et al.[6] observed that the IgM level was significantly lower in the one- and three-month postoperative monitoring examinations compared to the prior surgery level (P-value less than 0.001).

In contrast to the current findings, Dai et al.[12] observed that the concentrations of IgG and IgM at one-month post-surgery were significantly reduced compared to prior surgery levels; these levels reverted to baseline three months following the procedure. The alterations were statistically significant (P-value less than0.01).

In contrast to the current findings, Mohamdy et

al.[6] found a reduction in IgG serum levels one-month post-surgery compared to prior surgery levels (P = 0.005). Three months after surgery, IgG levels did not alter significantly from before surgery levels (P-value equal 0.16).

4. Conclusion

The findings of this investigation indicated a statistically insignificant distinction that had been observed in prior and following surgery levels of IgM, IgG, and IgA in the studied group.

Disclosure

The authors have no financial interest to declare in relation to the content of this article.

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All authors have a substantial contribution to the article

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