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Research Article

The Use of the Correlation between Tonsil and Adenoid Sizes in Clinical Assessment and Management

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Abstract

Objective: The aim of this study was to calculate the correlation between tonsil size and adenoid size and use this correlation to estimate the adenoid size based on the tonsil size for planning surgical and medical treatments. Assessing the size of the tonsils can be easily estimated by a general otolaryngology examination. However, adenoid size cannot be evaluated based on routine clinical assessment only, and a nasopharyngoscopy or lateral neck X-ray are needed to estimate adenoid size. **Methods:** We conducted this prospective study at the Maternity and Children Hospital in Abha city, which is in southwest Saudi Arabia, between January 2018 and December 2019. During the study period, 849 patients underwent adenotonsillectomy in our center. A total of 216 patients were enrolled in the study according to the inclusion and exclusion criteria (126 girls and 96 boys). The data that were gathered included age, sex, and the sizes of both tonsils and adenoids, which were measured preoperatively using flexible endoscopy and confirmed intraoperatively using visual inspection for the tonsils and laryngeal mirrors for the adenoids. Patients with allergic rhinitis, patients who used nasal steroids, and patients with asthma were excluded. Syndromic patients who underwent adenotonsillectomy for malignancy and had incomplete file records were excluded from the study. We analyzed the data using the SPSS package with significance at $P<0.05$. The results are expressed as numbers and percentages for categorical variables and as the mean and standard deviation for continuous variables. Chi-square tests were performed to determine the differences between categorical groups, and independent t tests were used to determine significant differences in the means. Pearson correlation tests were performed to determine the relationships between the variables. **Results:** We analyzed the data of 216 patients: 126 girls and 90 boys. Their ages ranged from 1 to 12 years with an average age of 5.5 years. We divided the patients into four groups based on the size of the tonsils and adenoids by the percentage of obstruction of the nasopharyngeal and oropharyngeal areas: Grade 1 (25-50%), Grade 2 (25-50%), Grade 3 (50-75%), and Grade 4 (more than 75%). A significant correlation was found in 128 of the 216 patients (59.3%) (Pearson correlation (R) = 0.242, p value = <0.001). The results indicated an overall correlation of 59.3% in all the groups, 52.9% in the large groups (Grades 3 and 4) and 70.5% in the small groups (Grades 1 and 2). **Conclusion:** Our results indicate that a patient who has large tonsils most likely has large adenoids. The study also revealed that there is a significant correlation between the size of the tonsils and that of the adenoids. This correlation can be used as a clinical clue in deciding whether to perform surgical or medical treatments. The literature and midline research has shown no previous study correlating the size of the tonsils to that of the adenoids.

Introduction

Waldeyer's ring in humans is nonencapsulated lymphoid tissue in oronasopharyngeal areas. These areas consist of the adenoids in the posterior wall of the nasopharynx, palatine tonsils in the oropharynx, lateral tubal tonsils and lingual tonsils in the glosso-epiglottic space [1]. The palatine tonsils and adenoids are derived from the second and third pouches, respectively, and show different patterns of growth and involution [2]. Large tonsils and adenoids are the main causes of mouth breathing, recurrent otitis media, recurrent sinusitis nasal congestion, hyponasal speech, snoring and obstructive sleep apnea in children [3]. Many studies have reported enlarged adenoids and tonsils as a cause of impaired growth and body development [4,5]. Many scoring systems to measure the size of the tonsils and adenoids have been used [6-8]. However, no single study has measured the correlation between adenoid size and tonsillar size. The importance of such a correlation is significant. First, knowing the estimated adenoid size will provide a better chance for perioperative counseling. Second, a nasal flexible scope is usually difficult to use in children and requires good patient cooperation. Occasionally, small tonsils do not reflect adenoid size. Some studies have suggested that adenoid and tonsil enlargement tend to coexist. Another study stated that adenoid and tonsil infections tend to coexist. For these reasons, many surgeons remove the adenoids along with any tonsillectomy procedure [9,10]. A study by Stearns found that there was no correlation between adenoid weight and tonsillar weight in 45 children who were admitted for adenotonsillectomy and concluded that adenoid and tonsillar hypertrophy do not always coexist [11].

Our study aimed to construct a relationship pattern of adenoid size based on tonsil size to help physicians in the clinical setting to easily predict the presence of adenoid hypertrophy without the use of lateral neck X-ray or fiberoptic examinations, as they are not always available in every center. This type of evaluation is time-consuming and is not always tolerated by children, especially uncooperative children.

Materials and Methods

This prospective study was conducted at the Maternal and Children Hospital in Abha, which is in southwest Saudi Arabia, between January 2018 and December 2019. The study was conducted only on patients who were attending clinics and had adenotonsillar-related diseases. During the study period, patients under the age of 12 years scheduled for elective adenotonsillectomy procedures were included. Patients with a history of nasal steroid use, allergic rhinitis, or asthma, patients who were syndromic, patients who underwent tonsillectomy for suspected malignancy and patients with incomplete file documentation were excluded from the study. The size of the tonsils and adenoids was measured twice, preoperatively by oral examination (tonsils) and nasopharyngeal endoscopic examinations (adenoids) and confirmed intraoperatively by nasopharyngeal mirror and visual examinations. To eliminate physician-to-physician variation, we used three independent evaluators to grade the tonsils and adenoids. We graded the tonsils and adenoids according to a classification system published by Brodsky and Friedman. In this classification system, the sizes of the adenoids and tonsils were divided into four groups according to the percentage of obstruction of both the oropharynx and nasopharynx: Grade 1 (less than 25%), Grade 2 (25-50%), Grade 3 (50-75%), and Grade 4 (more than 75%).

Data analysis was performed using the Statistical Package for Social Sciences (SPSS) version 23.0 (SPSS Inc., IBM, Armonk, New York, USA). Data were normally distributed. The results are expressed as numbers and percentages (for categorical variables) and as the mean and standard deviation (for continuous variables). Chi-square analysis was performed to determine the differences between the categorical groups, and independent t tests were used to determine significant differences in the means. Pearson correlation tests were performed to determine the relationships between the variables. A p value of ≤ 0.05 was considered statistically significant.

Results

During the study period, 849 adenotonsillectomy procedures were performed in our institute. Only 216 patients fulfilled the inclusion and exclusion criteria and were included in this study. A total of 120 patients were girls and 96 were boys. Their ages ranged from 1 to 12 years, with a mean age of 5.5 years. The distribution of tonsillar grades was as follows: Grade 1 (3.2%), Grade 2 (32.9%), Grade 3 (55.6%) and Grade 4 (8.3%). The distribution of adenoid grades was as follows: Grade 1 (9.3%), Grade 2 (46.3%), Grade 3 (32.4%), and Grade 4 (12%). Most patient tonsillar sizes were Grade 3. For adenoids, the most encountered size was Grade 2. The mean tonsillar grade in our sample was 2.69 ± 0.67 (SD) and the mean adenoid grade was 2.47 ± 0.82 (SD) (Table 1).

Variables	Mean ± Standard deviation. (range)	N (%)
Age, in years	5.50 ± 2.61 (1.0 to 12.00)	
Tonsil grade	2.69 ± 0.67 (1.0-4.0)	
Adenoid grade	2.47 ± 0.82 (1.0-4.0)	
Sex		
Male		126 (58.3)
Female		90 (41.7)
Tonsil grade		
1.0		7 (3.2)
2.0		71 (32.9)
3.0		120 (55.6)
4.0		18 (8.3)
Adenoid grade		
1.0		20 (9.3)
2.0		100 (46.3)
3.0		70 (32.4)
4.0		26 (12.0)
Tonsils		
Small		78 (36.1)
Large		138 (63.9)
Adenoids		
Small		120 (55.6)
Large		96 (44.4)

Table 1: Demographic profiles of the 216 patients.

Overall agreement between the tonsillar grade and adenoid grade was seen in 59.3% of patients, with a Pearson correlation (R) = 0.242 and a p value = <0.001 (Figure 1). When we divided patients into a small group (Grades 1 and 2) and a large group (Grades 3 and 4), the correlation was 70.5% in the small tonsillar group (G1, G2) compared to the small adenoid group (p value<0.001). In the large group (G3, G4), the correlation was 52.9% (p value <0.001). The above results indicate a statistically significant correlation even between the subgroups when we divide them into small (G1, G2) and large groups (G3, G4) (Figure 2).

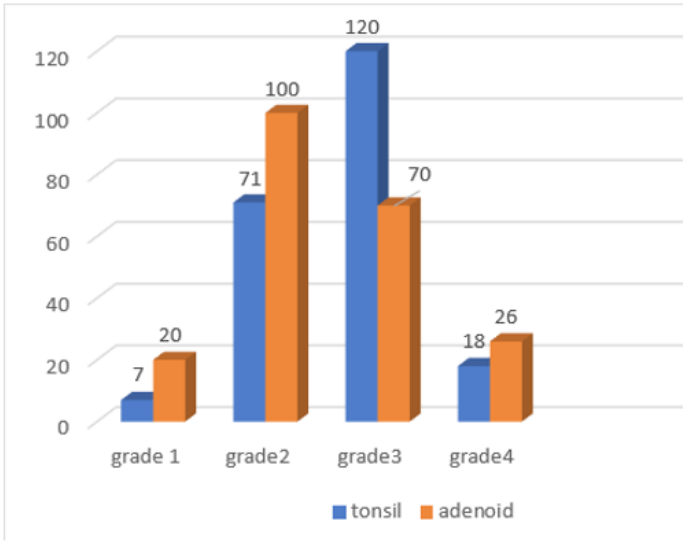

Figure 1: Distribution of adenoid and tonsil grades in the 216 patients (overall agreement was seen in 59.3% of the patients; (R)=0.242 and a p value=<0.001).

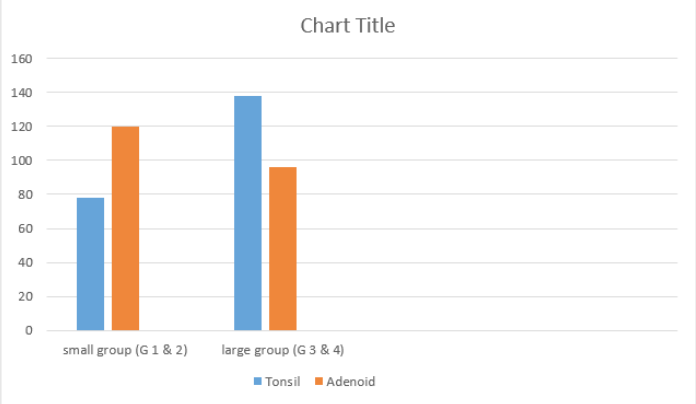

Figure 2: Agreement between tonsil and adenoid grades when subdivided into a small and large group (Agreement in the small group=70.5% (p value<0.001) Agreement in the large group =52.9% (p value <0.001)).

The effect of age on adenoid and tonsil size in this study was not significant (p value=0.834, p value=0.416, respectively (Table 2). According to the above results, the use of the correlation between tonsil and adenoid sizes can be useful in estimating adenoid size based on tonsillar size, especially in tonsillar groups G3 and G4. This correlation is not only useful in assessing the size of the adenoids but also helpful in family counseling and in planning medical and surgical treatments, especially for uncooperative patients and in centers with a lack of medical facilities.

Adenoid grade	Tonsil grade n (%)				Total n (%)	*p* value
	1	2	3	4		
1	2 (10.0)	7 (35.0)	10 (50.0)	1 (5.0)	20	<0.001
2	1 (1.0)	45 (45.0)	53 (53.0)	1 (1.0)	100	
3	2 (2.9)	15 (21.4)	42 (61.4)	10 (14.3)	70	
4	2 (7.7)	4 (15.4)	14 (53.8)	6 (23.1)	26	
Total	7 (3.2)	71 (32.9)	120 (55.6)	18 (8.3)	216	

	Age (mean ± SD)	*p* values
Tonsil size		
Small	5.31 ± 2.59	0.416
Large	5.61 ± 2.62	
Adenoid size		
Small	5.53 ± 2.62	0.834
Large	5.46 ± 2.60	

Table 2: Tonsil grade and adenoid grade among the 216 patients (Test: Chi-square analysis).

Discussion

Adenoid and tonsillar hypertrophy is a common case of upper-airway obstruction in pediatric patients and can have a significant influence on the health of a child. Due to recurrent adenotonsillitis and hypertrophy of the tonsils and adenoids, adenotonsillectomy is one of the most commonly performed surgical procedures by otolaryngologists [12]. The assessment of adenoid and tonsils varies among otolaryngologists. The adenoids are not amenable to direct visualization in routine clinical examinations. There are several methods to assess the size of adenoids and their impact on the nasopharyngeal airway. Although each of these approaches has merits, none of them has been accepted by most clinicians as a standard practice. Among the diagnostic modalities available, three methods continue to be used in the assessment of adenoid hypertrophy: patient symptoms, lateral neck X-ray, and endoscopic examination. Objective methods for diagnosing adenoid hypertrophy are valuable in providing information about the need for surgery [13]. Some otolaryngologists routinely use flexible/rigid scopes, while others believe that if large tonsils are revealed by simple oral examination, the adenoids will likely be large. Both adenoids and tonsils respond similarly to the same infections or any stimulus of hypertrophy. The reliability of clinical assessments in predicting the severity of nasopharyngeal obstructions has long been the subject of debate among researchers [14]. One study showed a significant correlation between the nasal obstruction score and the X-ray taken and the volume of removed adenoids. However, the score was subjective [15]. Another study found that no single symptom could predict the finding on endoscopy [16]. A study comparing clinical and radiological assessments found that the clinical assessment was considered a reliable tool but not sufficient to establish a definite diagnosis of adenoid obstruction [17]. In our study, we calculated the correlation between adenoid and tonsil sizes and used tonsillar size to predict adenoid size. The overall significant correlation between tonsil and adenoid grades was 59.3%. When we divided patients into large and small groups, the correlation in the large group (G3, G4) was 52.9% and the correlation in the small group (G1, G2 70.5%. To our knowledge, this is the first paper to examine this type of correlation and assess adenoid size based on tonsillar size. This correlation can be used to predict the size and percentage of adenoid obstruction based on tonsillar size. This method of assessment is extremely helpful, especially for uncooperative patients, patients with mental retardation, or patients in a center where there is a lack of medical facilities available for proper evaluations; this method is very useful in family counseling as well. In general, and based on our findings, we believe that if the tonsils are enlarged, the adenoids will likely be enlarged (Table 3).

Adenoid grade	Tonsil grade		Total	*p* value
	Small n (%)	Large n (%)		
Small	55 (45.8)	65 (54.2)	120	0.001
Large	23 (24.0)	73 (76.0)	96	
Total	78 (36.1)	138 (63.9)	216	

Table 3: Distribution of adenoid grades according to tonsil grades in the 216 patients (Test performed: Chi-square test).

Conclusion

This prospective study shows a strong correlation between the size of adenoids and that of tonsils. Predicting the size of adenoids based on tonsillar size is extremely helpful in many situations, especially for clinicians estimating the size of the adenoids and in certain uncooperative patients, patients with mental retardation, and family counseling for planning medical and surgical treatments.

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