Journal of Cardiovascular Disease Research

ISSN:0975 -3583,0976-2833 VOL13, ISSUE 05, 2022

Original research article

A STUDY ON SIGNIFICANCE OF ADENOID NASOPHARYNGEAL RATIO IN THE ASSESMENT OF ADENOID HYPERTROPHY IN CHILDREN

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Abstract

In determining whether adenotonsillar enlargement is sufficient to be clinically significant, the physician typically relies on history & physical examination. However, physical examination provides little information about size of adenoid, although enlarged tonsils may be proved easily. Several radiological techniques have been proposed to favour the decision for adenoidectomy. Name, age and sex were noted in all the cases. A detailed clinical history was taken regarding presenting complaints. General, ENT and systemic examination were done in all the cases according to predesigned proforma. Study sample was divided into 3 subgroups 4-6, 7-9 & 10-12 years. The mean ANR of 4-6 yrs is 0.7, 7-9 yrs is 0.7 and 10-12 yrs is 0.6. There is no statistically significant difference between mean ANR of 4-6 yrs and 7-9 yrs age group. But there is statistically significant difference between mean ANR of age group 4-6 yrs with 10-12 yrs and 7-9 yrs with 10-12 yrs.

Keywords: Adenoid nasopharyngeal ratio, adenoid hypertrophy, children

Introduction

Waldeyer's ring of lymphoid tissue become apparent clinically when they undergo hyperplasia. In the past decades it was not unusual to therapeutically remove enlarged adenoids & tonsils. But now it is recognized that lymphoid hyperplasia is not itself an indication for adenoidectomy. The nasopharyngeal tonsil was observed to become evident by six months to one year of life, increases rapidly in size during the first 6 to 8 years of life & generally atrophies by adolescence [1].

Adenotonsillectomy is one of the most frequent procedures in otorhinolaryngology. In determining whether adenotonsillar enlargement is sufficient to be clinically significant, the physician typically relies on history & physical examination. However, physical examination provides little information about size of adenoid, although enlarged tonsils may be proved easily. Several radiological techniques have been

ISSN:0975 -3583,0976-2833 VOL13, ISSUE 05, 2022

proposed to favour the decision for adenoidectomy [2].

In this study, we have attempted to find the adenoid - nasopharyngeal ratio [ANR] for all children in study group. ANR`s were calculated from lateral nasopharynx radiographs. We have selected 100 children between 4 - 12 years of age & analysed their lateral radiographs. We have tried to find out the significance of ANR, variation of ANR with relation to age & correlation between symptoms & adenoid size.

Methodology

Name, age and sex were noted in all the cases. A detailed clinical history was taken regarding presenting complaints. General, ENT and systemic examination were done in all the cases according to predesigned proforma. Study sample was divided into 3 subgroups 4-6, 7-9 & 10-12 years.

Symptoms was evaluated according to the presence of snoring, mouth breathing & sleep apnea in all children. For this purpose mothers were asked about the symptoms.

Subjects were evaluated with standard lateral cephalometric radiographs. These radiographs were taken with the childs head immobilized in a wall- mounted cephalostat, with the head in true lateral position. The head was fixed so that the median plane was parallel to the film.

By using the reference points and lines on lateral radiographs of nasopharynx, adenoid size and nasopharyngeal depth was calculated in all x-rays. Three lines drawn from posterior nasal spine; one to posterior superior sphenobasioccipital area, second to nearest adenoidal point and third to basion of occipital bone.

Reference points

U1: Intersection between adenoidal shadow and PSyL.

U1`: Intersection between nasopharyngeal surface of spheno- occipital bone and PSyL.

U2: Nearest adenoidal point to P.

U2`: Intersection between nasopharyngeal surface of spheno-occipital bone and PU2L.

U3: Intersection point between adenoidal shadow and PBaL.

Ba: Basion; most posteroinferior point on anterior margin of foramen magnum P- Posterior nasal spine; most posterior part of hard palate.

Sy: Posterosuperior point of sphenobasioccipital synchondrosis.

Reference Lines

PU2L: - Line through P and U2 PBaL - Line through P and Ba PSyL - Line through P and Sy

Ratios

ANR- Sy: Ratio of distance between U1 and U1` to distance between P and U1` ANR- U2: Ratio of distance between U2 and U2` to distance between P and U2` ANR – Ba: Ratio of distance between U3 and Ba to distance between P and Ba

ISSN:0975 -3583,0976-2833 VOL13, ISSUE 05, 2022

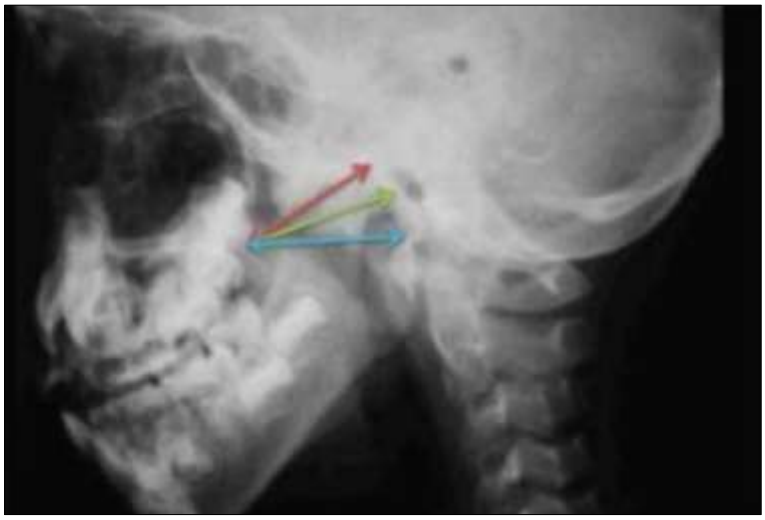

Fig 1: X-ray of nasopharynx with reference lines

Line red is U1 Line green is U2 Line blue is U3

Mean adenoidal depth & mean nasopharyngeal depth was calculated. By dividing the mean adenoidal depth by mean nasopharyngeal depth Adenoid Nasopharyngeal Ratio was calculated. Mean adenoid size, nasopharyngeal depth and ANR was compared in different age groups.

Results

Table 1: Adenoid size between age group

Adenoid size					
Age group	**N**	**Mean**	**Std. Deviation**	**Minimum**	**Maximum**
4-6yrs	27	2.1	0.3	1.00	2.60
7-9yrs	35	2.3	0.1	2.00	2.50
10-12yrs	38	2.2	0.3	2.00	3.00

ANOVA F value=5.172

p=0.007 – significant

Table 2: Bonferroni multiple comparison

Age group		Mean Difference	P Value
Adenoid Size	4-6yrs Vs 7-9yrs	-0.20	0.007
	4-6yrs Vs 10-12yrs	-0.08	0.685
	7-9yrs Vs 10-12yrs	0.13	0.108

Mean adenoid size in 4-6 yrs is 2.1cm, there is statistically significant increase during 7-9 yrs: 2.3cm, and later there is statistically significant decrease in 10-12 yrs: 2.2cm.

ISSN:0975 -3583,0976-2833 VOL13, ISSUE 05, 2022

Table 3: Nasopharyngeal depth between the age groups

Nasopharyngeal depth					
Age group	**N**	**Mean**	**Std. Deviation**	**Minimum**	**Maximum**
4-6yrs	27	2.8	0.3	2.00	3.20
7-9yrs	35	3.2	0.2	2.90	3.50
10-12yrs	38	3.5	0.2	3.00	4.00

ANOVA F Value=69.78

p=0.001 significant

Table 4: Bonferroni multiple comparison

Age group			Mean Difference	P Value
Nasopharyngeal depth	4-6yrs	Vs 7-9yrs	-0.37	0.001
	4-6yrs Vs 10-12yrs		-0.66	0.001
	7-9yrs Vs 10-12yrs		-0.30	0.001

There is statistically significant increase in nasopharyngeal depth as the age increases; in 4-6 yrs 2.8cm, 7-9 yrs 3.2cm and in 10-12 yrs 3.5cm.

Table 5: ANR between age groups

ANR					
Age group	**N**	**Mean**	**Std. Deviation**	**Minimum**	**Maximum**
4-6yrs	27	0.7	0.1	0.50	0.81
7-9yrs	35	0.7	0.0	0.60	0.80
10-12yrs	38	0.6	0.1	0.50	0.80

ANOVA F Value=49.51

p=0.001 significant

Table 6: Bonferroni multiple comparison

Age group		Mean Difference	P Value
ANR	4-6yrs Vs 7-9yrs	0.02	0.30
	4-6yrs Vs 10-12yrs	0.12	0.001
	7-9yrs Vs 10-12yrs	0.10	0.001

The mean ANR of 4-6 yrs is 0.7, 7-9 yrs is 0.7 and 10-12 yrs is 0.6. There is no statistically significant difference between mean ANR of 4-6 yrs and 7-9 yrs age group. But there is statistically significant difference between mean ANR of age group 4-6 yrs with 10-12 yrs and 7-9 yrs with 10-12 yrs.

ISSN:0975 -3583,0976-2833 VOL13, ISSUE 05, 2022

Table 7: Adenoid size at various symptoms

Symptoms	Mean	T Value	P value
Mouth Breathing	2.19 ± 0.32	0.249	0.804
Snoring	2.2 ± 0.2	4.08	0.001
Mouth Breathing + Snoring	2.3 ± 0.3	3.98	0.001
Mouth Breathing + Snoring + Sleep apnea	1.90 ± 0.14	2.35	0.02

There is significant increase in adenoid size in children presenting with mouth breathing and snoring – 2.3 cm.

Discussion

In 1889 Dr. William Hill presented a paper at the meeting of the Royal Society of medicine in Leeds entitled "On some cases of backwardness and stupidity in children, relieved by adenoid scarification".

Hill wrote that "The stupid looking lazy child who frequently suffers from headache at school; breathes through his mouth instead of his nose, snores and is restless at night". The children Hill described benefited from adenoidectomy and credit goes to him.

Symptomatic adenoid hypertrophy is common in paediatric population. Adenoidectomy is one of the most commonly performed procedures in this age group. Due to its location in the posterior nasopharyngeal airway, assessment of the size and degree of adenoid hypertrophy is challenging [3].

Multiple modalities to quantify adenoid tissue and its relationship to the nasopharyngeal airway have been devised. Lateral radiographs of nasopharynx and nasal endoscopy are used to assess the size of adenoids. However, there is currently no clear standard to guide the treating physician. This study was done to validate X- rays which is an important noninvasive diagnostic test [4].

We have selected 100 childrens between 4 to 12 years of age and analysed their lateral radiographs. We preferred to adopt the method of Yusuf KK *et al*., as the landmarks used by them could be easily located on the X-ray. We calculated adenoid – nasopharyngeal ratio. By doing so we tried to find a reliable and practical radiologic parameter for evaluating the degree of enlargement of the adenoid [5].

Study group was divided into three groups that is; 4-6 years, 7-9 years and 10-12 years. Our study was compared with those done by Yusuf K. Kemaloglu *et al*., Elwany *et al*., Soroosh Mahboubi *et al*. and Fujioka *et al*. [5].

ANR was first described by Fujioka *et al*., in 1979 as a reliable method of expressing the size of adenoids and patency of nasopharyngeal airway wherein a comparison of the amount of lymphoid tissue in the nasopharynx to the size of nasopharyngeal compartment was made. He studied 1,398 children with lateral radiographs of nasopharynx and calculated ANRs. He stated that for practical purposes a value of ANR greater than 0.80 may be considered indicative of enlarged adenoids [6].

Yusuf K Kemaloglu *et al*. studied 150 children from 4-10years in 1999. The ratio of adenoidal depth to nasopharyngeal depth which was both measured on the same line was taken as the ANR. The data in his study clearly demonstrated that ANRs was a reliable objective criterion for evaluation of adenoidal hypertrophy [7].

Elwany *et al*. studied 200 children from 3-7years in 1987. He reported ANR of and 0.71 for normal and adenoidectomy children respectively in the age group of 2-12 years [8].

ISSN:0975 -3583,0976-2833 VOL13, ISSUE 05, 2022

Mahboubi *et al*. studied lateral radiographs [both supine and erect] of 27 children. His ANR values were 0.79 in erect and 0.69 in supine position [9].

Our ANRs are similar to study done by Fujioka *et al*., Yusuf K Kemaloglu., Elwany *et al*, Mahboubi *et al*. [10].

Conclusion

- We found that adenoid size increase during 7-9 years and decreased during 10-12years. There was significant increase in nasopharyngeal depth as the age progresses from 4-12years.
- There was significant difference between ANR of age group 4-6 and 7-9 with 10- 12 years group. Adenoid size was found to be maximum when children presented with mouth breathing and snoring.
- Our study gives support to the assumption that the ANR is a more convenient radiologic parameter for determining whether adenoid hyperplasia is clinically significant or not, rather than the size of adenoid or the size of nasopharynx.
- To conclude, ANR > 0.7 are considered to be the candidates for adenoidectomy.

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Accepted on 23/05/2022