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ORIGINAL ARTICLE

Radiological Versus Endoscopic Assessment of Adenoid Hypertrophy in Relation to Clinical Grading

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ABSTRACT

Background: Radiology, endoscopy, and clinical evaluation are the three most used diagnostic modalities for adenoids. This research aimed to evaluate the most accurate method for assessment of adenoid hypertrophy (radiological versus endoscopic Assessment).**Patients and methods:** We carried out this cross-sectional study on 60 children with chronic adenoid hypertrophy recruited from the ENT outpatient clinic in Zagazig university hospitalfor management their problem. During the initial assessment, a diagnostic nasal endoscopy was conducted utilizing both rigid and flexible endoscopes.X-ray nasopharynx lateral view was done for all patients. **Results:** By X ray 30% of the cases were Grade I, 31.7% were Grade II, 18.3% were Grade III and 20 % were Grade IV. By endoscope 30% of the cases were Grade I, 31.7% were Grade II, 28.3 were Grade III and 10% were Grade IV. Statistically significant agreements were revealed between the clinical grading and X ray ($p<0.001$), the clinical grading and endoscope ($p=0.003$), X ray and endoscope ($p<0.001$).Statistically significant positive correlation was found between grading by clinical examination and both X ray and endoscope ($p<0.001$).The sensitivity of X ray in diagnosis of the adenoid obstruction was 83.3%, specificity was 94.4%, PPV 62.5%, NPV 98% and Accuracy was 93.33% in comparison to endoscope as gold standard. **Conclusion:** The X-ray alone can rule out adenoidal hypertrophy, but alone it could be insufficient for assessment of the degree of adenoidal obstruction. Endoscopy was found to be more reliable, convenient, correlate well with the volume of adenoid tissue and allow estimation of adenoidal hypertrophy with degree of obstruction. This study demonstrates that combining clinical grading with endoscopy and radiology is important for the evaluation of adenoid hypertrophy.

Key Words: Radiological, Endoscopic Assessment, Adenoid Hypertrophy, Clinical Grading.

INTRODUCTION

The adenoid, or nasopharyngeal tonsil, is a lymphoid mass that is lobulated and located on the back and front of the nasopharynx. It joins Waldeyer's ring with an unfinished capsule. At birth, it grows quickly; but, between the ages of 8 and 10, it typically experiences some atrophy and involution [1]. Rapid growth persists throughout infancy and, for the majority of children, reaches a plateau between the ages of 2 and 14. Nevertheless, because of the nasopharynx's diminutive volume and the higher incidence of upper respiratory tract infections, clinical symptoms manifest more frequently in younger age groups [2].

The X-ray nasopharynx soft tissue lateral view is an easy, painless, accessible, non-invasive, and two-dimensional method of assessing the adenoids' size, shape, and placement. Radiation exposure, inaccurate results, and reduced precision are some of the method's drawbacks [3].

Adenoscopy size diagnosis is greatly aided by nasoendoscopy, which is a safe, dependable, and tolerably invasive technique that provides a three-dimensional picture. Among nasoendoscopy's many benefits are its ability to reveal the true extent of choanal blockage and adenoids' real sizes. Unfortunately, it is an invasive technique that youngsters must undergo [4].

Clinical assessment is the easiest, useful, and the most reliable one, but its disadvantages that parents may miss symptoms, children may mislead doctors about some symptoms and children who cannot cooperate [5].

Previous studies have undertaken various investigations to examine the correlation between clinical symptoms and the severity of adenoid hypertrophy. Clinical evaluation, radiography, and endoscopy are still widely utilized diagnostic modalities; therefore researchers always seek to identify the best modality to evaluate adenoid hypertrophy. [6]. so, this research aimed to evaluate the most accurate method for assessment of Adenoid hypertrophy (radiological versus endoscopic assessment).

PATIENTS AND METHODS

We carried out this cross-sectional study on 60 children with chronic adenoid hypertrophy in the period from May 2023 to May 2024 in the Otorhinolaryngology Department, Zagazig University Hospitals. The ages ranged from 3 to 13 years irrespective of sex. 27 were females and 33 were males.

Written informed consent was collected from all parents of the participants. The approval for the study was obtained from the Institutional Review Board (9275) and the research was conducted in accordance with the Helsinki Declaration.

We included patients from both genders aged between 3 and 13 years, who had nasal obstruction due to adenoids, who had history of mouth breathing, presence of snoring, nocturnal drooling, noisy sleep, daytime sleepiness and hyaline rhinorrhea, those who had radiographic confirmation of adenoid hypertrophy encroaching on to the airway column.

We excluded all cases who had congenital anomalies like choanal atresia, Down's syndrome, patients who had allergic rhinitis, significant septal deviations, hypertrophied inferior turbinate, patients with other causes of nasal obstruction: nasal polyps, granuloma swellings.

Methods: Complete history taking including: A detailed history including nasal blockage, snoring, mouth breathing, and recurrent rhinitis. Complete ENT Clinical evaluation: focusing on detailed nasal examination. Clinical grading of the obstruction was done I for score between 1 and 4 representing mild, II for score between 5 and 8 representing moderate, III for score between 9 and 12 representing moderately severe, IV for score between 13 and 16 representing severe [7].

Symptom and score Nasal and paranasal severity: absent snoring or mouth breathing with score 1, few occasions of snoring or mouth breathing with score 2, whenever asleep snoring or mouth breathing with score

3, always present snoring or mouth breathing with score 4 [7].

Otological examinations for assessment of suppurative otitis media: absent otologic pathology with score 1, occasional serous otitis media with score 2 , persistent serous otitis media with score 3 , unilateral or bilateral chronic suppurative otitis media with score 4 , **craniofacial abnormalities:** absent craniofacial abnormalities with score 1, elongated dull looking face with score 2, crowded dentition , high arched palate, elongated pinched upper lip with score 3, all features of adenoid facies with score 4 ,as well as **examination of sleep disturbances :** absent obstructive sleep apnea with score 1, present obstructive sleep apnea occasionally with score 2, present obstructive sleep apnea every day with less or equal 3 episodes / night daily with score 3 , more than 3 episodes / night daily with score 4. [7].

Every patient underwent: Diagnostic nasal endoscopy and X-ray nasopharynx lateral views.

Diagnostic nasal endoscopy

The first assessment included a diagnostic endoscopy of the nose utilizing both the rigid and flexible endoscopes. To avoid trauma, flexible endoscopy was necessary in severely hypertrophied turbinates and in young children. After spraying the patient's nose with 10% lidocaine, the examination was conducted under local anesthetic. At intervals, adults instructed the youngster to swallow and inhale via the mouth.

Examination was performed using a 0-degree telescope (Rigid type). The nasopharynx was the aim of the examination.Itis done in non-cooperative children under general anaesthesia before operation. The relative size of adenoid tissue when seen was estimated by observing the distance between the choanae and adenoid tissue relative to the nasopharynx, then 1, 2, 3 and 4 scores were given, (1=maximum distance "free nasopharynx", to 4=no space "adenoids reach to choanae") The roof and posterior walls of the nasopharynx were examined [7].

Radiological examination

X-ray nasopharynx lateral view was done for all patients, the patient was asked to inhale, not to speak or swallow while standing with the head held high. Aside from the child's parent or guardian, these instructions were also communicated to the X-ray technician. The distance from the posterior wall to the relaxed soft palate, and that from the posterior wall to the choanae , were assessed, and grading of the adenoid obstruction -when present- was done on a grade of four**,** 1+, 2+, 3+, or 4+.relative to 25%, 50%, 75%, or 100% obstruction respectively.(0-25% grade I, 25-50% grade II, 50-75% as grade III,75-100% as grade IV) [7].

Statistical Analysis:

We used (IBM SPSS Statistics for Windows, Version 27.0. Armonk, NY: IBM Corp.) To gather, tabulate, and analyze all of the data. Number and percentage were used to represent qualitative data, whereas mean ± SD and range were used for quantitative data. To compare paired ordinal variables, the marginal homogeneity test was utilized. When comparing two normally distributed variables, paired t was employed. To determine the difference between the qualitative variables, a chi-square test was employed. When determining the degree of association between two ordinal qualitative variables, Spearman's correlation coefficient

is employed. The level of agreement between various diagnostic procedures was assessed using Crohn's Kappa agreement test. When the p-value was less than 0.05, we said that the result was statistically significant; when it was equal to or greater than 0.05, we said that the result was statistically insignificant (NS).

RESULTS

The studied cases ranged in age from 3 to 13 years with mean 6.87 years.Regarding sex,45% of the studied cases were females and 55% were males, by Clinical grading 20% of the cases were Grade I, 36.7% were Grade II, 26.6% were Grade III, and 16.7% were Grade IV (Table 1).

By X ray 30% of the cases were Grade I, 31.7% were Grade II, 18.3 % were Grade III, and 20% were Grade IV. Regarding obstruction, 86.7% had partial obstruction while 13.3% had complete obstruction. By Endoscope 30% of the cases were Grade I, 31.7% were Grade II, 28.3% were Grade III and 10% were Grade IV (Table 2).

By clinical grading 20% of the cases were Grade I, 36.7% were Grade II, 26.7% were Grade III, and 16.6% were Grade IV. While by X ray 30% of the cases were Grade I, 31.7% were Grade II, 18.3% were Grade III and 20 % were Grade IV with statistical significance agreement between the clinical grading and X ray ($p<0.001$) (Table 3).

by clinical grading 20% of the cases were Grade I, 36.7% were Grade II, 26.7% were Grade III, and 16.6% were Grade IV. While by Endoscope 30% of the cases were Grade I, 31.7% were Grade II, 28.3% were Grade III and 10% were Grade IV with statistically significant agreement between the clinical grading and endoscope ($p=0.003$) (Table 4).

By X ray 30% of the cases were Grade I, 31.7% were Grade II, 18.3% were Grade III, and 20% were Grade IV. While by endoscope 30% of the cases were Grade I, 31.7% were Grade II, 28.3% were Grade III and 10% were Grade IV with statistically significant agreement between X ray and endoscope ($p<0.001$) (Table 5).

In comparison of 3 methods; by clinical grading 20% of the cases were Grade I, 36.7% were Grade II, 26.7% were Grade III, and 16.6% were Grade IV. While by X ray 30% of the cases were Grade I, 31.7% were Grade II, 18.3% were Grade III and 20 % were Grade IV. By endoscope 30% of the cases were Grade I, 31.7% were Grade II, 28.3 were Grade III and 10% were Grade IV. Statistically significant agreements were found between the clinical grading and X ray ($p<0.001$), the clinical grading and endoscope ($p=0.003$), X ray and endoscope ($p<0.001$) (Table 6).

The sensitivity of X ray in diagnosis of the adenoid obstruction was 83.3%, specificity was 94.4%, PPV 62.5%, NPV 98% and Accuracy was 93.33% in comparison to endoscope as gold standard (Table 7).

Table (1): Age, sex distribution and clinical grading of the studied cases

Variable		(*n*=60)	
Age : (year)			
Mean ± SD		6.87 ± 3.07	
Range		3 – 13	
Variable		**(n=60)**	
		No	**%**
Sex:			
Female		27	45
Male		33	55
Variable		**(n=60)**	
		No	**%**
Clinical grading Symptomatology	Grade I	12	20
	Grade II	**22**	**36.7**
	Grade III	16	26.7
	Grade IV	10	16.6

Table (2): X-ray and Endoscopic Grading results among the studied cases

		(n=60)	
		No	**%**
X- ray	Grade I (0-25% obstruction of nasopharynx)	18	30
	Grade II (25% - 50% obstruction of nasopharynx)	19	31.7
	Grade III (50%-75% obstruction of nasopharynx)	11	18.3
	Grade IV (75%-100% obstruction of nasopharynx)	12	20
Obstruction:	Partial	52	86.7
	Complete	8	13.3
Endoscopic Grading		**(n=60)**	
		No	**%**
Grade I (Adenoid tissue filling 1/3rd. of the vertical height of choana.)		18	30
Grade II (Adenoid tissue filling 2/3rd. of the vertical height of choana.)		19	31.7
Grade III (From 2/3rd to nearly all but not completely filling the choana.)		17	28.3
Grade IV (Complete choanal obstruction)		6	10

Table (3): Comparison of Clinical findings and X ray findings of the adenoid obstruction among the studied cases

Grade of obstruction	Clinical grading (n=60)		X ray (*n*=60)		Kappa	P
	No	%	No	%		
Grade I	12	20	18	30	**0.46**	**<0.001 ****
Grade II	22	36.7	19	31.7		
Grade III	16	26.7	11	18.3		
Grade IV	10	16.6	12	20		

Kappa: Crohn's Kappa test **: Highly significant (P<0.001)

Table (4): Comparison of Endoscopic and Clinical findings of the adenoid obstruction among the studied cases

Grade of obstruction	Clinical grading (n=60)		Endoscope (n=60)		Kappa	P
	No	%	No	%		
Grade I	12	20	18	30	**0.36**	**0.003 ***
Grade II	**22**	**36.7**	19	31.7		
Grade III	16	26.7	17	28.3		
Grade IV	10	16.6	6	10		

Kappa: Crohn's Kappa test *: Significant (P<0.001)

Table (5): Comparison of Clinical findings and X ray findings of the adenoid obstruction among the studied cases

Grade of obstruction	X ray (*n*=60)		Endoscope (n=60)		Kappa	P
	No	%	No	%		
Grade I	18	30	18	30	**0.71**	**<0.001 ****
Grade II	19	31.7	19	31.7		
Grade III	11	18.3	17	28.3		
Grade IV	12	20	6	10		

Kappa: Crohn's Kappa test **: Highly significant (P<0.001)

Table (6): Comparison of Clinical findings and X ray findings of the adenoid obstruction among the studied cases

Grade of obstruction	Clinical (n=60)		X ray (*n*=60)		Endoscope (n=60)		Kappa	P
	No	%	No	%	No	%		
Grade I	12	20	18	30	18	30	**0.46 [1]**	**<0.001****
Grade II	**22**	**36.7**	19	31.7	19	31.7	**0.36 [2]**	**0.003***
Grade III	16	26.7	11	18.3	17	28.3	**0.71 3**	**<0.001****
Grade IV	10	16.6	12	20	6	10		

Kappa: Crohn's Kappa test *: Significant (P<0.05) **: Highly significant (P<0.001)

P1: Clinical versus X ray P2: Clinical versus endoscope P3: X ray versus endoscope

Table (7): Validity of X ray in diagnosis the adenoid obstruction in comparison to Endoscope as a gold standard

X ray:	Endoscope				Total
	Completely Obstructed		Partially obstructed		
Completely Obstructed	5 (True +ve)		3 (False +ve)		**8**
Partial obstructed	1 (False –ve)		51 (True –ve)		**52**
Total	**6**		**54**		**60**
Validity	**Sensitivity**	**specificity**	**PPV**	**NPV**	**Accuracy**
X ray	**5/6 83.3**	**51/54 94.4**	**5/8 62.5**	**51/52 98**	**56/60 93.33**

NPV: negative predictive value PPV: positive predictive value

DISCUSSION

This study aimed to evaluate the most accurate method for Assessment of Adenoid hypertrophy; numerous researchers were tired about determining the best method for evaluating it [6].

In the present study, patients ranged in age from (3-13) years with mean age 6.87, this agreed with Sarma and Khaund. [8]Who found that symptoms caused by enlarged adenoids tend to manifest more frequently between the ages of 6 and 10. Also, Pathak et al. [9] revealed thathis study involved fifty children, ranging in age from three to fourteen, who exhibited clinical symptoms consistent with adenoiditis. Reasons for this high frequency include rapid adenoid tissue growth, a short nasopharynx, and the low

immunity in young children, which causes the highest frequency of recurrent upper respiratory tract infections [8].

Regarding sex distribution of the studied group 45% of the studied cases were females and 55% were males, aligns with Sarma and Khaund. [8]Who found that 56 % of the studied group were male and 44% were females. Also,Pathak et al. [9] revealed thatOf the 50 patients who were examined, 21 were female (42% of the total) and 29 were male (58%). The gender ratio was 1.33 to 1(males to females).

Our results detected that after **clinical grading** about,(20% of the cases were Grade I, 36.7 % of Cases were grade II and 26.7% of cases were grade III, 16.7% were Grade IV), Also **after x ray** (30% of the cases were Grade I, 31.7% of cases were grade II , and 18.3 % were grade III, 20% were Grade IV) and **endoscope** diagnose (30% of the cases were Grade I, 31.7% of cases were grade II and 28.3 were grade III and 10% grade IV), these findings were in agreement with findings from Jyothirmai et al. [10] who reported thatIn the majority of grade II cases, there was a correlation between the clinical and lateral neck x-ray gradings. However, in a small number of cases, the clinical grading was higher than the x-ray grading due to severe clinical symptoms that could not be detected on the x-ray. Adenoid hypertrophy severity was determined to be reliably assessed by clinical grading. Despite the fact that x-rays are a quick and easy way to diagnose adenoid hypertrophy, they aren't as precise as endoscopy [10, 11]**.** Similar to a study conducted by Sharifkashani et al. [12], where the clinical score correlated well with endoscopic findings, a highly significant association between endoscopy and clinical grading is primarily observed in moderately severe to severe (grade IV& grade III) adenoid hypertrophy.

Also, Gill et al. [13] reached the following conclusion: while lateral X-ray of the nasopharynx is still a reliable diagnostic tool, nasal endoscopy is quickly becoming the gold standard for diagnosing adenoid hypertrophy. Nevertheless, both methods are seen as complementary and work together for the benefit of the patient.

In the same context,Pisutsiri et al. [14] reported that Adenoidal-nasopharyngeal (A/N) ratios of 72.9, 79.5, and 81.6 were found, respectively, using lateral skull film, flexible endoscopy, and intraoperative rigid endoscopy. The A/N ratio from the lateral skull film and intraoperative rigid endoscopy showed a moderate association (Pearson's correlation: 0.567, $p<0.001$). While there was a stronger correlation between the A/N ratio from flexible endoscopy and intraoperative rigid endoscopy (Pearson's correlation: 0.791, $p<0.001$), the researchers found that flexible endoscopy was more accurate in assessing adenoid size and nasopharynx visualization. Although lateral skull film is more accessible in every hospital, the results were still moderately accurate.

Our findings revealed that there was statistically significant agreement between the clinical grading and X ray, However other study by Lertsburapa et al. [15] who found that when it came to subjectively assessing plain nasopharyngeal radiographs, there was a high level of agreement between the raters who were otolaryngologists (who detect clinical grading) and radiologists (who detect x-ray grading) (Kappa test =0.81). Paradise et al. [16] likewise found very high levels of agreement;therefore our results were consistent with theirs.

Our findings showed that The X-ray and

endoscopic results were statistically in agreement,our results in harmony withPathak et al. [9] found that X-ray and endoscopic methods showed a high degree of concordance. The p-value is less than 0.001, indicating statistical significance, and the kappa analysis was conducted on approximately 78% of the data. The results of the endoscopic and X-ray exams were in good agreement in the study by Yogita Dixit et al. [11], with a correlation of 62%. Our findings are in agreement with those of Yaseen et al. [17], who compared the X-ray and endoscopic methods and found a highly significant p value.

In addition, our results detected that there was a statistically significant +ve correlation between grading by clinical examination and (both X ray, endoscope) (p value < 0.001, <0.001) respectively. Also, there was a statistically significant +ve correlation between grading by X ray and endoscope (p value < 0.001)**.** These findings in harmony with Jyothirmai et al. [10] who reported thata highly significant association was found between endoscopic and clinical grading (p=<0.001), a strong correlation was found between radiological and endoscopic grading (p=<0.001), and a substantial correlation was found between clinical grading and radiological findings (p=0.04).

Our results showed that the sensitivity of X ray in diagnosis of the adenoid obstruction was 83.3%, specificity was 94.4%, PPV 62.5%, NPV 98% and Accuracy was 93.33% in comparison to endoscope as gold standard. Our findings higher than Pathak et al. [9] who found the X-ray method has a positive predictive value of 87.10%, a negative predictive value of 63.16%, a specificity of 75%, and a sensitivity of 79.41%.

When diagnosing adenoidal size, nasoendoscopy is a useful tool since it is safe, dependable, well tolerated, and provides a three-dimensional picture. The ability to determine the precise dimensions of adenoids and the extent of choanal blockage is the primary benefit of nasoendoscopy. One potential drawback is that endoscopy isn't always easy to perform on younger children because it requires their participation [4].

X-ray nasopharynx soft tissue lateral view is an easy, two-dimensional method of assessing the size, shape, and placement of adenoids; it is also inexpensive, easily accessible, non-invasive, and comfortable for the child. In underdeveloped nations without access to modern diagnostic equipment, this is among the most reliable methods for determining adenoidal size. Radioactive contamination is a potential risk associated with this modality. Endoscopic grading differs from lateral neck x-rays in that it directly visualizes the postnasal space, unlike x-rays, which are affected by postural changes in the patient's position during the procedure, breathing pattern, and uncooperativeness, which all contribute to the radiographs' appearance of soft tissue [3,18].

The limited number of our sample size (60 patients) is one of the limitations of our study. Furthermore, not all historical information and events that could affect the conclusion have been thoroughly recorded. Also, our study was performed in one single center. For a more accurate assessment of most accurate method for assessment of adenoid hypertrophy, future research should be more extensive and involve a larger number of patients.

CONCLUSION

The X-ray alone is able to rule out adenoidal hypertrophy with a high degree of confidence,

that's to say it is a good negative, and one can rely on X-ray results to deny adenoids, but alone it may be insufficient to assess the degree of adenoidal obstruction. So, we can rely on X-ray to say that patient has adenoidal hypertrophy or not, but we can't rely on it to decide to do operation. On the other hand endoscopy was found to be more reliable, convenient, correlate well with the volume of adenoid tissue and allow estimation of adenoidal hypertrophy with degree of obstruction, compared to these results seen with X-ray. This study demonstrates that combining clinical grading with endoscopy and radiology is important for the evaluation of adenoid hypertrophy.

No potential conflict of interest was reported by the authors.

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