The Relationship between Adenoid Hypertrophy and Maxillary Rhinosinusitis in Children

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Abstract:

Background: The role of adenoids in rhinosinusitis is not completely understood. Current opinion states that the adenoids act as a reservoir for pathogenic bacteria and interferes with nasal mucociliary clearance, even without being obstructive. Obstructive adenoids on the other hand may cause stasis of nasal secretions with resultant infection.

Objective: To evaluate the effect of adenoid size in pediatric rhino sinusitis as a cause of mechanical blockage.

Patients and Methods: This cross sectional study included (150) Children. The size of adenoid was graded according to endoscopic findings. The grades of maxillary rhinosinusitis were determined by radiological findings of water’s view.

The results were analyzed and the X-ray findings of the maxillary sinuses were correlated with the size of adenoid on endoscopic examination.

Results: The highest incidence of adenoid hypertrophy was seen in 3-5 years old Children (60%), with male: female ratio as 1.1:1. The frequency of positive water’s view maxillary sinus X-ray findings among hypertrophied adenoid patients were (51%), The highest frequency of maxillary sinus X-ray findings was noted in grade III adenoid (46.7%).

Conclusions: The adenoid grade determined endoscopically is significantly associated with increasing in positivity of water’s view x-ray findings.

Key words: Paediatric rhinosinusitis, Adenoid hypertrophy, Maxillary sinusitis.

Introduction

For normal physiologic function of the paranasal sinuses, the ostia must be patent, the cilia should be functioning effectively, and the secretions should be normal. Retention of secretions in the paranasal sinuses can be due to one or more of the following: obstruction of the ostia, reduction in the number or impaired function of the cilia, or overproduction or change in the viscosity of secretions. According to current understanding of sinus physiology, the primary sinus abnormality for initiation of rhinosinusitis is obstruction of the osteomeatal complex by mucosal edema or mechanical obstruction. Various local, regional, or systemic factors may lead to an obstruction of the osteomeatal complex. Local and regional factors include nasal septal deviation, nasal polyps, and anatomic variants such as choanal atresia, edema attributed to viral infections, allergic inflammation, and nonallergic rhinitis.

Other factors that have been attributed to the etiology of pediatric rhinosinusitis include innate and acquired immune deficiencies, gastroesophageal reflux, environmental pollution, malnutrition and biochemical abnormalities.

Although many conditions can lead to obstruction of the natural ostia, viral upper respiratory tract infections and allergic inflammation are by far the most frequent causes.

Hypoxia following sinus obstruction leads to ciliary dysfunction and abnormal movement of mucus from the sinus, this helps the bacteria in the upper respiratory tract to multipy and invade the mucosa of the obstructed sinus.

The aim of the study is to evaluate the effect of adenoid size in pediatric rhino sinusitis as a cause of mechanical blockage.

Patients and method:

This cross sectional study included (150) Children were seen and examined in the outpatient clinic of E.N.T Department of Al-Yarmouk Teaching Hospital from January 2009 - January 2010. Their ages ranged from 3-12 years. All patients with craniofacial abnormalities, other possible predisposing factors of rhinosinusitis such as sepal deviation, previous history of sinus surgery or adenoidectomy and patient below 3 years or above 12 years old were excluded from the study.

The size of adenoid was determined according to Clemens et al classification, by which grade I adenoid was labeled when the adenoid tissue filling (1) one third of the vertical portion of the choanae, grade II when filling from one third to two thirds of the choanae, grade III from two third to nearly complete obstruction of the choanae and grade IV complete choanal obstruction.

The grade of maxillary rhinosinusitis was determined by radiological findings of water’s view. Grade 0 was defined as no abnormal findings in the maxillary sinuses bilaterally, grade 1 as mucosal thickening in the maxillary sinuses bilaterally, grade 2 as mucosal thickening on one side and total haziness on the other side, and grade 3 as total haziness of the maxillary sinuses bilaterally.

Data analysis was carried out by calculating percentages. Chi squared test was used to analyze the association between adenoid hypertrophy and maxillary rhinosinusitis in children. Criterion for statistical significance was set at p<0.05.

Results

The mean age of the studied patients was 6 years (6 ± 2.33). The highest incidence of adenoid hypertrophy was seen in 3-5 years old Children (60%). Gender distribution revealed that 81 patients (54%) were males and 69 patients (46%) were females. The Male: female ratio was 1.1:1. The commonest grade of adenoid size was grade III, 50 patients (33.3%) and the lowest grade of adenoid size was grade I, 20 patients (13.3%). As shown in table (1)
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Table 1: Numbers of patients with adenoid hypertrophy according to adenoid grading

<table>
<thead>
<tr>
<th>Adenoid grade</th>
<th>Patients with adenoid hypertrophy (n=150)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>No.</td>
</tr>
<tr>
<td>IV</td>
<td>37</td>
</tr>
<tr>
<td>III</td>
<td>50</td>
</tr>
<tr>
<td>II</td>
<td>43</td>
</tr>
<tr>
<td>I</td>
<td>20</td>
</tr>
</tbody>
</table>

The commonest grade of maxillary rhinosinusitis (according to water’s view) was grade 0, 73 (48.6%), while the lowest grade was grade 3, 6 patients (4.0%) as shown in table (2).

Table 2: Grading of maxillary rhino sinusitis (based on water’s view)

<table>
<thead>
<tr>
<th>Grading of Maxillary rhinosinusitis</th>
<th>Patients with adenoid hypertrophy (n=150)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>No.</td>
</tr>
<tr>
<td>0</td>
<td>73</td>
</tr>
<tr>
<td>1</td>
<td>60</td>
</tr>
<tr>
<td>2</td>
<td>11</td>
</tr>
<tr>
<td>3</td>
<td>6</td>
</tr>
</tbody>
</table>

The frequencies of positive findings in water’s view among hypertrophied adenoid patients were 77, while the lowest frequency of water’s view findings were noted in grade I adenoid, 5 patients (25%) out of 77 as shown in table 3.

Table 3: The distribution of adenoid grade (based on fibrooptic nasopharyngoscope) and findings in the maxillary rhino sinusitis (based on water’s view)

<table>
<thead>
<tr>
<th>Adenoid grade based on fibrooptic nasopharyngoscope</th>
<th>Positive waters view maxillary sinus x-ray findings</th>
</tr>
</thead>
<tbody>
<tr>
<td>IV (n=37)</td>
<td>22 (59.5)</td>
</tr>
<tr>
<td>III (n=50)</td>
<td>36 (72.0)</td>
</tr>
<tr>
<td>II (n=43)</td>
<td>14 (32.6)</td>
</tr>
<tr>
<td>I (n=20)</td>
<td>5 (25.0)</td>
</tr>
<tr>
<td>Total (n=150)</td>
<td>77 (51.3)</td>
</tr>
</tbody>
</table>

P=0.0001 (Highly significant using chi-squared test at 0.05 level of significance)

Discussion:
The maximum incidence of adenoid hypertrophy was seen in 3-5 years old Children, 90 patients (60%). The mean age of our patients was 6 years (6 ± 2.33). These findings are probably due to rapid growth of lymphoid tissue and relative decrease in post nasal space and to the incidence of upper respiratory tract infection during childhood period. (6)

Fujioko etal reported that adenoidal-Nasopharyngeal ratio reached its highest value at age 4 years and then decreased. (7)

Pruzansky in his study reported that large adenoids were most frequently observed in the ages of 6-8 years. (8)

A study by A.S. Bercin et al reported that adenoids reach a maximum size at the age of 3-7 years, and then start to regress. (9)

A study by E.S. Kolo and his colleagues revealed that 22 (64.7%) were males and 12 (35.3%) were females in their study of 34 children with obstructive adenoids. (10) While the results of the current study revealed that 81 patients (54%) were males and 69 patients (40%) were females, with male to female ratio as 1.1:1. Differences probably were due to the larger sample involved in the current study.

The commonest grade of adenoid size in the current study was grade III, 50 patients (33.3%) followed by grade IV, 37 patients (24.6%) as shown in table (1).

The commonest grade of maxillary rhinosinusitis (according to water’s view) was grade 0, 73 (48.6%), while the lowest grade was grade 3, 6 patients (4.0%) as shown in table (2).

The overall incidence of positive findings in water’s view among hypertrophied adenoid patients were 77 patients out of 150 patients (51%) as shown in table 3.

Paul and Preston reported higher incidence of rhinosinusitis 68% and 69% respectively in children with adenoid hypertrophy. (11,12) Differences from the results of the current study probably explained by the size of the study sample and the weather circumstances which encountered during their studies.
According to table (3) which assess the relationship between water’s view findings & adenoid size, the highest incidence of water’s view findings was noted in grade 3 adenoid size, 36 patients out of 50 (72%). But the frequency of reporting positive findings in water’s view decreased in grade IV (59.5%) if compared to grade III (72%), these differences may be explained by the larger sample of patients with grade III adenoid size, hence a future study with emphasis on this fact should be considered to evaluate the possible involved reasons. However, in both grade III and grade IV the frequency of positive findings in water’s view were higher than other grades. There was highly significant correlation between adenoid grade diagnosed endoscopically and water’s view x-ray findings (P= 0.0001).

A probable explanation for that, hypertrophied adenoid obstructing the posterior choanae interfering with the natural drainage of the nasal and hence the sinus secretions resulting in stasis which provide good media for bacterial growth and consequently infection of the parasinal sinuses.

These findings support the role of adenoids as mechanical obstruction in the causation of sinusitis.

Georgalas and his colleagues concluded that there is a high association between adenoidal hypertrophy and rhinosinusitis in their study. (13)

Tuncer and his colleagues reported that there is no correlation between cultures obtained from the adenoid tissue with those from the maxillary sinus and it seems possible that the adenoids act as a barrier causing mechanical obstruction rather than a nidus for chronic sinus infection. (14)

Merck in his study divided the children with sinusitis into 3 groups according to size of their adenoid, he observed that 34% of large adenoid group showed signs of sinusitis on radiograph examinations as compare to 13% in small adenoid group. (15)

Van Cauwenberg et al supported the role of adenoid in maxillary rhinosinusitis and their explanation based on the fact that the sinuses lies in closed anatomical contact with the adenoid, it is tempting to presume that pathological process in nasopharynx will influence the sinuses. This influence, however might work in the other direction in which rhino sinusitis might cause adenoiditis or adenoid hypertrophy. (16)

Lec and Rosen Feld studied the adenoid role in pathogenesis of rhinosinusitis and they conclude that the adenoid may cause mechanical obstruction of nasopharynx resulting in stasis of secretions and infections. (17)

Ramadan and Tiu reported that adenoid hypertrophy may mimic sinusitis symptoms by causing obstruction & stasis of secretions this stasis in turn obstruct sinus ostium and cause sinusitis. (18)

Ungkanont and Damrongsk reported that adenoidectomy should be most beneficial as a surgical option before endoscopic sinus surgery (ESS), especially in younger children with obstructive symptoms. (19)

On the other hand Fukuda et al reported no difference in adenoidal-nasopharyngeal ratio (taken by lateral X-ray of post nasal space) between sinusitis and control groups also he reported no correlation between sinustis severity and adenoid volume on CT scan. (20)

The conclusion is that Maximum age incidence of adenoid hypertrophy in children was in 3-5 years.

The adenoid gradings determined endoscopically is significantly associated with increasing in positivity of water’s view X-ray findings.

Further investigations are needed to explain the relation between adenoid as reservoir for pathogenic bacteria and microbiological evaluation of maxillary rhino sinusitis.

References:
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