EUSTACHIAN TUBE DYSFUNCTION OF ADENOID ORIGIN

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Abstract. Objective: Eustachian tube dysfunction is one of the most frequent otic pathologies, being the starting point in most local inflammatory processes. Within the pediatric population, the adenoidal hypertrophy is the most frequent cause of tubal dysfunction. The purpose of this study was to show the implications of adenoid tissue hypertrophy in the genesis of Eustachian tube dysfunction. Methods: The study covered 18 months and included 126 child patients, between 3 and 6 years of age, diagnosed with chronic rhinoadenoiditis. All patients were carefully investigated, clinically and paraclinically (nasal and otic endoscopy, tympanogram, tubal manometry). Results: 98 patients presented otic and rhinologic moderate or severe symptoms and in these cases an adenoidectomy was performed. The other 28 children with low intensity symptoms received medical treatment. The re-evaluation made after four weeks revealed a very good evolution of symptoms after the surgery. Conclusions: Adenoid hypertrophy is the first cause of Eustachian tube dysfunction in children. To ensure a normal function of the auditory tube, in these cases an adenoidectomy must be performed, followed by a periodic reassessment.

Keywords: Eustachian tube dysfunction, adenoidectomy, chronic adenoid hypertrophy, Eustachian tube.

Introduction

Eustachian tube dysfunction represents one of the most frequent otic pathologies, being the starting point for almost all the acute or chronic otic inflammatory processes and their consequences. Tubal dysfunction and otitis media with effusion are the most frequent pathologies within the pediatric population. During their first seven years of life almost 70% of children present at least one episode of Eustachian tube dysfunction and two episodes of otitis media with effusion, the incidence peak being in the first two years.

The Eustachian tube is the tubular structure that links two of the major areas of interest: the ear and the nasopharynx. Bluestone and Doyle attributed three major functions to the Eustachian tube – ventilation, clearance and protection of the middle ear [1]. Any disturbance of these functions can lead to Eustachian tube dysfunction.

In children, the Eustachian tube is shorter than in adults and has an almost horizontal course [2]. This anatomical peculiarity can explain the high incidence of Eustachian tube dysfunction in this age group.

There are many causes leading to Eustachian tube dysfunction. Among children, the most frequent cause is the adenoid hypertrophy, nasopharyngeal lymphoid tissue part of the Waldeyer ring. Its role was first described in 1868 by Meyer [3]. This tissue can lead to the mechanical and/or inflammatory obstruction of the nasopharyngeal ostium of the auditory tube.

The clinical context of tubal obstruction is complex. The most important symptoms that make the parents bring their child to the doctor are: nasal obstruction, oral respiration and hypoacusis. The latter is observed in most of the cases by the parents and in a small number of cases related by the children themselves. At first even the adults believe that their children, being preoccupied with their games, don't concentrate enough.

In our study, which included child patients, we wanted to show the role played by the adenoid tissue in the genesis of Eustachian tube dysfunction, otitis
media with effusion and hypoacusis. It is important to diagnose and rapidly treat a tubal dysfunction associated with adenoid hypertrophy, considering the fact that Eustachian tube dysfunction is the primary cause of hypoacusis found in these children.

Material and methods

The study was performed during 18 months on 126 child patients aged 3 to 6 (the mean age: 4.44) (Graph no. 1) with hypertrophic adenoids. The demographic data revealed a boys/girls ratio of 1.37/1 (73 boys/53 girls).

All patients were fully investigated: clinical and endoscopic examination of the nasopharynx and ear, audiological evaluation (tympanogram and tubal manometry).

The therapy choice was influenced by the investigations’ results and consisted in surgical and medical treatment. The re-evaluation was made after four weeks and included clinical and paraclinical exams.

Results

The most important symptoms that the patients presented at their first evaluation consisted of: nasal obstruction which was not influenced by decongestant medication (115 cases), hypoacusis (98 cases), anterior or anteroposterior rhinorrhea (87 cases), chronic cough (85 cases) and snoring (53 cases) (table I).

<table>
<thead>
<tr>
<th>Symptoms</th>
<th>No.</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Nasal chronic obstruction</td>
<td>115</td>
<td>91.27%</td>
</tr>
<tr>
<td>Hypoacusis</td>
<td>98</td>
<td>77.78%</td>
</tr>
<tr>
<td>Anterior/anteroposterior</td>
<td>87</td>
<td>69.04%</td>
</tr>
<tr>
<td>rhinorrhea</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Chronic cough</td>
<td>85</td>
<td>67.46%</td>
</tr>
<tr>
<td>Snoring</td>
<td>53</td>
<td>42.06%</td>
</tr>
</tbody>
</table>

Tabel 1. Patients symptoms

Hypoacusis, found in 77.78% of the cases, was observed in most of the cases by the parents (e.g. „he/she watches the TV very loud”; „he/she does not respond when called”; „he/she asks us to repeat what we have just said”). A small number of children, especially those aged 5 to 6, have recognized the hearing problems themselves. There were 28 patients without otic symptoms, in whom the audiologic evaluation revealed a Eustachian tube malfunction.

The anamnesis gave us useful information about the child patients’ medical history. As such, 76.19% of the children (96 cases) presented several episodes of otitis media with effusion in the past and 18.25% (23 cases) had suffered an adenoidectomy without a good influence on Eustachian tube function.

The rhinopharynx examination revealed an adenoid hypertrophy of different grades (figure 1 – without nasal or tubal obstruction; figure 2 – with tubal obstruction). In 32 cases, peritubal lymphoid tissue was discovered, cases in which LASER vaporization was needed.
The otic endoscopic examination showed different aspects of the tympanic membrane (table II): normal aspect – 22.23% of the cases – figure 3; retracted tympanic membrane – 28.57% of the cases – figure 4; air bubbles and a yellow membrane in middle ear effusion 49.20% of the cases – see figure 5.

The next step in the examination of the patients was the evaluation of the Eustachian tube and middle ear normal function. This was made through the tympanogram and the tubal manometry.

The tympanogram results revealed pathologic curves in 98 cases (40.47% type B curve and 37.30% type C curve). Also, in 28 cases a type A curve with negative pressure values, -50 to -150 daPa, appeared (table III).

<table>
<thead>
<tr>
<th>Tympanic membrane</th>
<th>No. of patients</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Normal aspect</td>
<td>28</td>
<td>22.23%</td>
</tr>
<tr>
<td>Retracted membrane</td>
<td>36</td>
<td>28.57%</td>
</tr>
<tr>
<td>Middle ear effusion</td>
<td>62</td>
<td>49.20%</td>
</tr>
</tbody>
</table>

Table II. Tympanic membrane aspect

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The tympanogram results revealed pathologic curves in 98 cases (40.47% type B curve and 37.30% type C curve). Also, in 28 cases a type A curve with negative pressure values, -50 to -150 daPa, appeared (table III).

<table>
<thead>
<tr>
<th>Grades</th>
<th>No. of patients</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Low</td>
<td>36</td>
<td>28.58%</td>
</tr>
<tr>
<td>Moderate</td>
<td>32</td>
<td>25.39%</td>
</tr>
<tr>
<td>Severe</td>
<td>58</td>
<td>46.03%</td>
</tr>
</tbody>
</table>

Table III. Tympanogram aspects

The therapy choice was influenced by the clinical and paraclinical examinations’ results. Surgery was indicated in those cases with adenoid hypertrophy and otic complications – type B or C curve on the tympanogram and moderate or severe Eustachian tube dysfunction. The children without otic symptoms but with a type A
curve with negative pressure values received medical treatment – nasal decongestant, antihistamines and anti-inflammatory medication.

The surgical procedures consisted in either the classical adenoidecnectomy or the LASER vaporization.

After four weeks, the patients were reassessed both clinically and paraclinically and a positive evolution was found in all cases. From a subjective point of view, the parents described a significant improvement of the symptoms of their child. The objective evaluation led us to the same conclusion. The nasal obstruction and rhinorrhea showed a good remission in comparison with the primary evaluation.

All 62 patients with middle ear effusion at the first examination showed no retrotympanic effusion after one month. Still, a retracted tympanic membrane was still found in 32 patients.

56.86% of the patients who presented a type B curve on the tympanogram at the beginning of the treatment (29 cases) had a decrease of the middle ear effusion with an increase of the curve’s amplitude (becoming a type C curve) and good pressure values in tubal manometry. Also, 43.14% of the children (22 cases) presented a type A curve with negative pressure values (Graph no. 3).

Out of the 47 patients with a type C curve at their first evaluation, 57.45% presented a complete recovery of the auditory tube function – type A tympanogram, while 42.55% (20 cases) still had negative pressure values.

Graph 2. The tympanic membrane aspect (first and second evaluation)

Graph 3. Tympanogram aspect (first and second evaluation)

All children with a type A tympanogram with negative pressure at their first evaluation and who received medical treatment presented no improvement of the symptoms at the second evaluation after four months.

Discussions

Eustachian tube dysfunction and chronic rhinoadenoiditis represent two related pathologies, regarding the fact that the obstruction and the inflammation that appear secondary to adenoids hypertrophy can lead to auditory tube dysfunction. Within the pediatric population, the rhinopharynx lymphoid tissue hypertrophy is the primary cause of Eustachian tube dysfunction and its complications.

The adenoids can determine the anatomic or functional obstruction of the auditory tube. In his
studies, Bluestone accepted the idea that because of the small air volume from the rhinopharynx, when the lymphoid tissue appears, the local pressure is bigger than the initial one [4].

According to the results found in both the literature [5] and our study, the most frequent symptoms that appear in adenoids hypertrophy are nasal obstruction, rhinorrhea and snoring. When hypoacusis is present, it is a sign of otic complications. If we consider the fact that Eustachian tube dysfunction is the primary cause of hypoacusis in children, a correct and fast diagnosis and treatment are important.

The most important Eustachian tube function and the first one affected by the adenoids obstruction is the ventilation function. This is why measuring the middle ear pressure values and the tube’s permeability play an important role in the diagnosis and follow up.

Of great use in evaluating the middle ear pressure and air volume, the tympanic compliance is tympanometry, a test also used in our study for diagnosis and evaluation. According to the studies made in 1970 by Jerger and later by Margolis there are three major types of tympanograms [6, 7]. A normal Eustachian tube function and a normal middle ear air pressure appears like a type A curve with +50 to -150 daPa pressure values in children.

Any disturbance of Eustachian tube functions, in our case the adenoids hypertrophy, leads to its dysfunction. A type C curve on the tympanogram, with pressure values between -150 and -400 daPa, is characteristic to this otic pathology [8]. Still, an Eustachian tube malfunction can be considered even when we have a type A curve with negative pressure values, as we found in 43.14% of the patients included in our study. The type B tympanogram is characteristic to the middle ear effusion.

When we have a pathologic tympanogram (type B or C curve), Eustachian tube dysfunction is a definite diagnosis and it can’t be excluded even if we have a type A curve with negative pressure values. This is why a tubal manometry should be made in all cases.

To establish a proper function of the auditory tube, especially that of the rhinopharyngeal tubal ostium, the local determining factors should be resolved, in this case the adenoids. In this study we performed both the classic surgery, adenoidectomy, and the LASER vaporization. Adenoidectomy began to be widely used in 1885, with peak levels in the 1960’s [3, 9]. The current accepted indications differ from one author to the other [10] but it still represents the first therapeutical approach in cases of chronic rhinoadenoiditis associated with Eustachian tube dysfunction or otitis media with effusion.

Different studies showed an important improvement of Eustachian tube function after adenoidectomy [11], conclusion that also resulted from our study.

An important part played in the consolidation of the surgery benefit, but also in the treatment of Eustachian tube dysfunction, is related to medical therapy. The antihistamines, the immunotherapy and the trophic therapy like heliomarine cure, were indicated to all the patients included in our study.

Tubal reeducation is also important. Good respiration hygiene, open-close tubal maneuvers, sports, all of these can lead to a good nasal respiration and a normal functioning of tube’s muscles.

Conclusions

Chronic rhinoadenoiditis is the major cause of Eustachian tube dysfunction in the pediatric population. There can be different degrees of adenoids hypertrophy and different adenoids’ locations. According to these facts there are three degrees of Eustachian tube dysfunction.

In order to ensure a good functioning of the auditory tube and to avoid Eustachian tube’s dysfunction otic complications, in children with hypertrophic adenoids, adenoidectomy has to be made, followed by periodic reassessment.

References