

**ORIGINAL PAPERS****Is adenoidectomy an effective therapy for otitis media with effusion?**

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**ABSTRACT**

**INTRODUCTION:** Chronic otitis media with effusion is the most common otic pathology found in paediatric population. The most frequent cause of middle ear effusion among children is adenoid hypertrophy. The aim of this study was to prove if adenoidectomy is the most effective therapy for otitis media with effusion.

**MATERIALS AND METHODS:** The retrospective study included 119 child patients diagnosed with middle ear effusion and chronic rhinoadenoiditis. The diagnostic protocol included clinical and paraclinical examination (otic endoscopy, tympanogram, tubal manometry). In all patients the adenoidectomy was performed. The reevaluation was performed at one and three months after surgery and consisted in the evaluation of the otic symptoms.

**RESULTS:** The follow-up made at one month revealed that 43.70% of the patients presented a complete recovery of the Eustachian tube function, in 37.81% of the cases there was a mild Eustachian tube dysfunction and 18.49% of the children still had retrotympanic effusion. At three months after surgery most of the children (109) presented a total recovery of the otic disease, but in 8.40% of the cases the middle ear effusion persisted despite the good evolution of nasal symptoms.

**CONCLUSIONS:** Adenoidectomy can be considered an effective therapy choice for otitis media with effusion. But there are cases in which, despite the surgery, the middle ear effusion persists because of the anatomical and physiological peculiarities of Eustachian tube in children. In all these cases other medical measures should be taken (tympanotomy, tympanostomy tubes).

**INTRODUCTION**

Otitis media with effusion (OME) is the inflammatory status of the middle ear, defined by the presence of effusion behind an intact tympanic membrane. It is one of the most common otic pathology found in paediatric population.

OME is a highly prevalent condition among children, at least 80% experience one or more episodes by age four<sup>1</sup>. 30% of the children have three or more episodes until age of six, the peak incidence being in the first two years of life (68%)<sup>2,3</sup>.

At a young age, the Eustachian tube function and the inflammatory response of the nasopharynx lymphoid tissue are two important factors in the development of otitis media with effusion.

The presence of the retrotympanic fluid is a significant cause of childhood morbidity, being the primary cause of hypoacusis found in these children. This is why a correct management is important.

There is an enormous controversy regarding the efficacy of the various medical and surgical treatments of otitis media with effusion<sup>4</sup>. First used in 1885, adenoidectomy represents the removal of the hypertrophic adenoid tissue<sup>5</sup>. This procedure resolves the mechanical obstruction of the Eustachian tubes and can be the key in the management of OME.

In the following study we wanted to show the efficiency of adenoidectomy in treating otitis media with effusion in children.

**MATERIAL AND METHODS**

The retrospective study was performed during 14 months on 119 pediatric patients aged 3 to 6 (the mean age: 4.35) with otitis media with effusion and adenoid hypertrophy. The demographic data showed boys/girls ration of 1.08/1, meaning 62 boys/57 girls.

**Table 1**  
**Patient's symptoms**

Symptoms	Nr.	%
Nasal obstruction	119	100%
Hypoacusis	119	100%
Snoring	64	53.79%
Rhinorrhea	82	68.90%
<b>Chronic cough</b>	<b>18</b>	<b>15.13%</b>

**Study inclusion criteria:**

1. middle ear effusion confirmed by otic endoscopy or microscopy
2. adenoid hypertrophy confirmed by nasal endoscopy;
3. type B or C<sub>2</sub> impedance curve;
4. no previous adenoidectomy, tympanotomy or tympanostomy tubes.

At their first evaluation all the parents related nasal obstruction and hypoacusis. Rhinorrhea (68.9%), snoring (53.79%) and chronic cough (15.13%) completed the symptoms (Table 1).

Anamnesis revealed that 87.39% of the children included in the study had one or more episodes of otitis media with effusion.

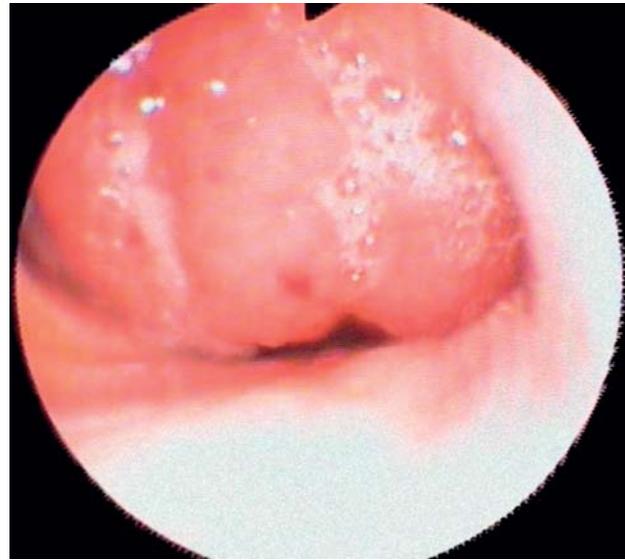
The diagnosis protocol consisted in clinic examination, nasal and otic endoscopy and audiological evaluation (tympanometry, tubal manometry).

In all cases the therapy of choice was adenoidectomy, which was made under local anesthesia. At one and three months after surgery all children have been reevaluated clinically and paraclinically.

**RESULTS**

The first evaluation of the rhinopharynx revealed the hypertrophy of the adenoidal tissue with nasal and tubal obstruction (Figure 1). The middle ear fluid was confirmed with the otic endoscopic examination. The tympanic membrane appeared yellow, retracted, with air bubbles (Figure 2).

The Eustachian tube and middle ear function were evaluated through the tympanogram and tubal manometry. Tympanometry revealed a flat type B

**Figure 1** Adenoid hypertrophy with nasal and tubal obstruction**Figure 2** Otitis media with effusion

curve in 73 children included in the study and a type C<sub>2</sub> curve in 46 cases (Table 2). In all cases the tubal manometry showed a severe Eustachian tube dysfunction (Figure 3).

The first reevaluation of the children has been made at one month after surgery. From the subjective point of view, most of the parents related an improvement of the nasal and otic symptoms. The nasal endoscopic examination revealed a good local evolution, without residual adenoids in all children. The tympanogram and tubal manometry measurements showed a different evolution of the middle ear function.

36.98% of the patients with a type B impedance curve at the beginning of the treatment presented a

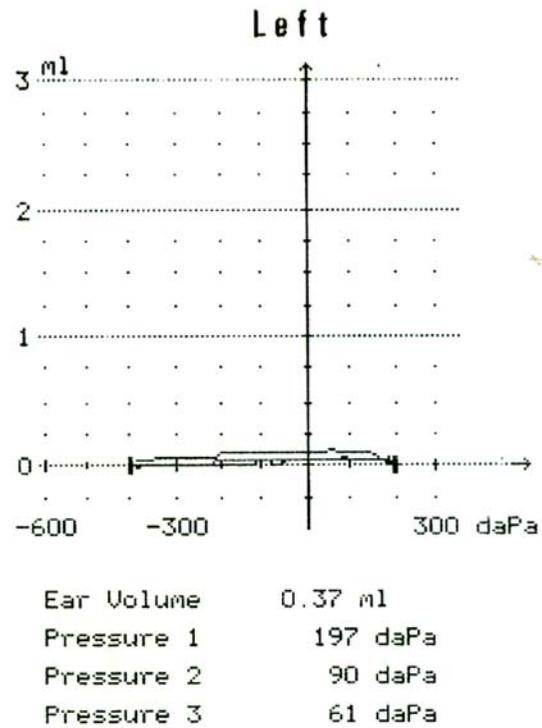
	Nr.	%
Type B curve	73	61.34%
Type C2 curve	46	38.66%

total recovery of the middle ear and Eustachian tube's function (Figure 4). 46 children (63.03%) had a decrease of the middle ear effusion with an increase of the curve's amplitude: 41.10% of them had a type C<sub>1</sub> curve and 21.92% a type C<sub>2</sub> curve.

54.35% of the patients with type C<sub>2</sub> curve at the first evaluation presented a type A curve at one month after surgery and 32.61% a type C<sub>1</sub> curve. Unfortunately, 13.04% of the children still had a type C<sub>2</sub> curve with no recovery of Eustachian tube function (Figure 5).

So, at one month after surgery a normal Eustachian tube function was seen in 43.70% of the children (Figure 6). In 37.81% of the cases (22 children) persisted a mild Eustachian tube dysfunction (Figure 7). But in 18.49% of the patients there still was an important quantity of retrotympanic fluid – type C<sub>2</sub> impedance curve (Figure 8).

At three months after surgery, when the second reassessment was made, 109 children (91.60%) presented a total recovery of the middle ear function with a normal Eustachian tube activity (Figure 9). Still, despite the correct management, the rigorous follow-up and the perfect evolution of the nasal func-

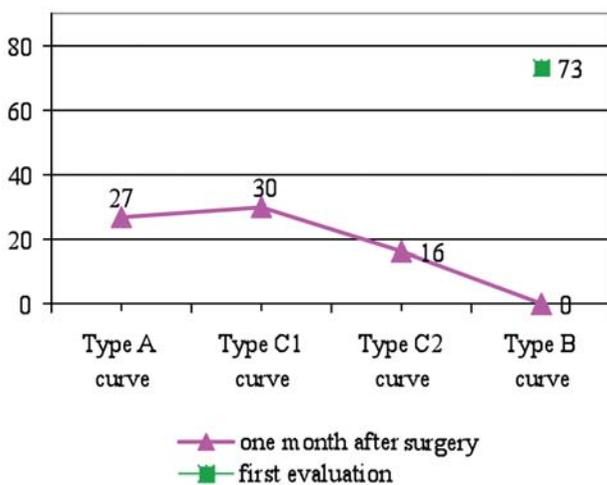


**Figure 3** Severe Eustachian tube dysfunction

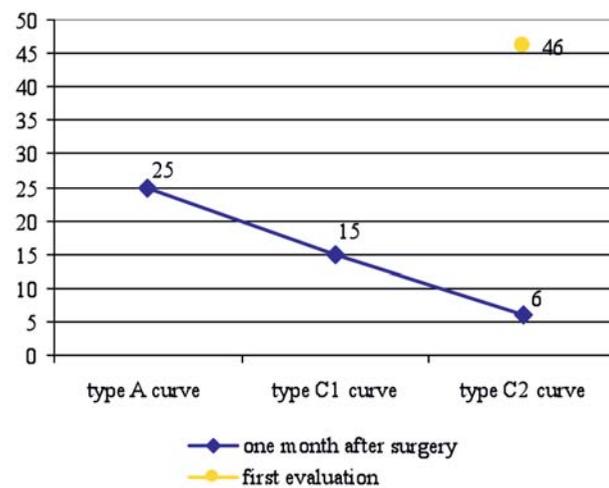
tion, in 8.40% of the cases (10 children) the middle ear effusion persisted with a type C<sub>2</sub> impedance curve (Figure 10).

**DISCUSSIONS**

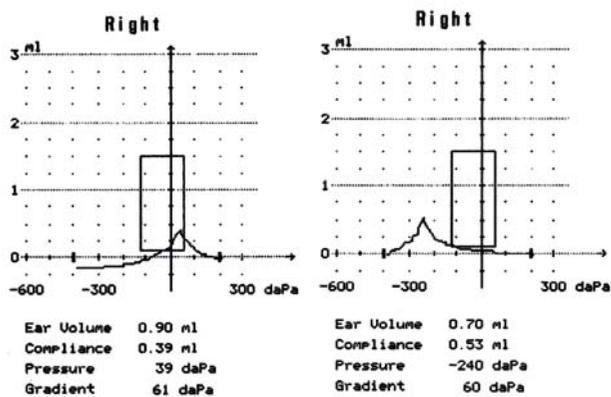
Otitis media with effusion can be considered the first otic pathology for which parents bring their children to the specialist. It is well known that the etiology of middle ear effusion is complex. Factors like allergy, infec-



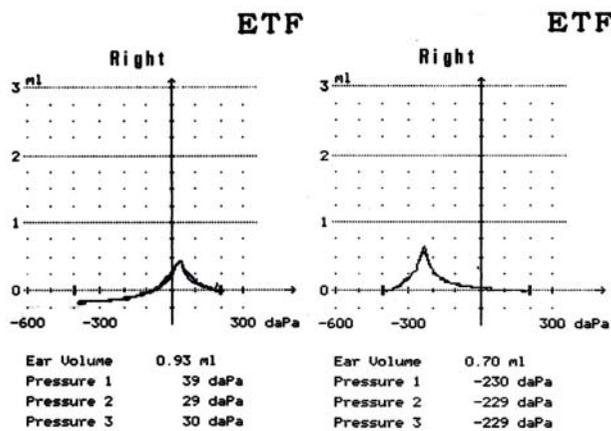
**Figure 4** Type B curve evolution at one month after surgery



**Figure 5** Type C2 curve evolution at one month after surgery



Right				Right			
Ipsi	500Hz	95dB	PASS	Ipsi	500Hz	80dB	PASS
Ipsi	1000Hz	85dB	PASS	Ipsi	1000Hz	85dB	PASS
Ipsi	2000Hz	90dB	PASS	Ipsi	2000Hz	90dB	PASS
Ipsi	4000Hz	100dB	NR	Ipsi	4000Hz	100dB	PASS



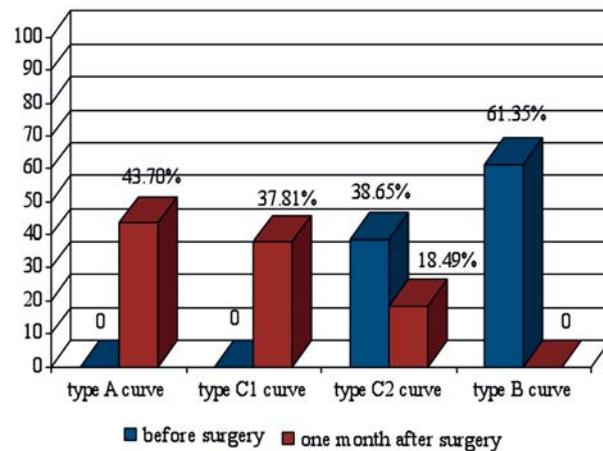
**Figure 6** Type C<sub>2</sub> curve evolution at one month after surgery

**Figure 7** Mild Eustachian tube dysfunction

tions, Eustachian tube's functional status, and socioeconomic factors can play an important part in the development of this disease<sup>6</sup>. From all these, the functional state of the Eustachian tube is the first to be taken in consideration, knowing its three important functions: ventilation, clearance and protection of the middle ear<sup>7</sup>.

The Eustachian tube dysfunction can appear due to obstructive factors or an alteration of its permeability. The obstruction can be caused by the adenoids, their hypertrophy and inflammation leading to an auditory tube dysfunction. Because of the adenoid mass, the air volume from the rhinopharynx becomes smaller and the local pressure bigger than initial one<sup>8</sup>. The consequence of this phenomenon is the reduction of the ventilation of the middle ear and the accumulation of liquid.

According to the results found in both literature<sup>9</sup> and



**Figure 8** Type C<sub>2</sub> curve evolution at one month after surgery

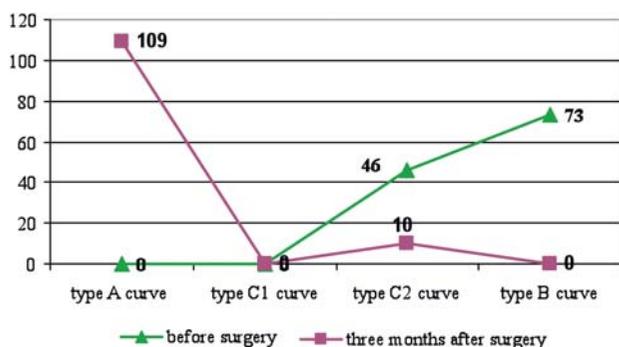
our study, the primary effect of middle ear effusion is hypoacusis, status which can have a great impact upon the future cognitive development of the child.

Considering the fact that a pure-tone audiogram is a test hard to make in children, the tympanometric objective measurements can offer good, reliable information upon middle ear and Eustachian tube's function. According to ASHA, the test has a high sensitivity of 84% and a specificity of 95%, with a positive predictive value of 69% and a negative one of 98%<sup>10</sup>. Characteristic for otitis media with effusion, according to Jerger<sup>11</sup>, is a flat, type B impedance curve. But in more than 55% of the cases middle ear fluid was found in ears with a type C<sub>2</sub> curve (pressure = -200 to -400daPa), and in 17% with a type C<sub>1</sub> curve (-100 to -199daPa), facts correlated with our study results.

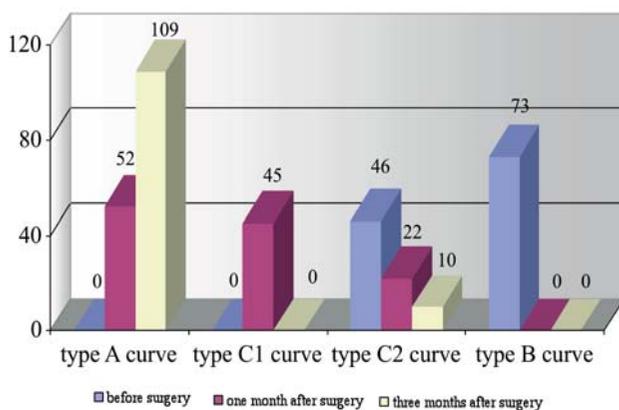
As already has been said, within paediatric population the primary cause of Eustachian tube dysfunction and middle ear effusion is the hypertrophic adenoiditis, nasopharyngeal lymphoid tissue part of the Waldeyer ring<sup>5</sup>. To establish a proper function of the auditory tubes an adenoidectomy should be performed.

Adenoidectomy was first used in 1885, with a peak level in 1960's<sup>12</sup>. The current accepted indications for this type of surgery differ from one author to the other. Still it is the first therapy of choice in those cases of chronic rhinoadenoiditis associated with recurrent otitis media with effusion. Different studies showed an important improvement of Eustachian tube function after adenoidectomy<sup>13,14</sup>. Školoudik et al presented in their study the fact that adenoidectomy can be efficient in 82 – 90% of the cases, depending on the adenoids size<sup>15</sup>.

Still, there are cases in which after a successful surgical approach the children remain symptomatic with no evidence of otic recovery. In such situations the



**Figure 9** Type B curve evolution at one month after surgery



**Figure 10** Type C2 curve evolution at one month after surgery

presence of residual or recurrent adenoid tissue should be determined. In our study this problem has been eliminated in those cases with persistent OME.

Another cause of persistent middle ear effusion after adenoidectomy is the anatomical and physiological peculiarities of Eustachian tubes. In children, the length of auditory tubes is smaller than in adults. Also, the tube has almost a horizontal course, the angle between the auditory tube and the horizontal plane is of only  $10^\circ$ . This anatomical configuration can facilitate the propagation of the infection from the rhinopharynx in the middle ear. Also, the immaturity of the local immune system can explain the recurrence and persistence of the middle ear effusion in children after adenoidal removal<sup>7</sup>.

In all these cases another medical measurement should be taken, like tympanotomy with or without tympanostomy tubes insertion.

## CONCLUSIONS

Adenoids hypertrophy represents the primary cause of otitis media with effusion among paediatric popu-

lation. In order to establish a proper function of the Eustachian tubes and middle ear adenoidectomy should be made. In most of the cases the surgical approach is a success, but there can be children with a persistence of middle ear effusion despite the adenoidal removal. In this situation another medical measurements should be taken.

Regarding the small number of cases with persistent middle ear fluid after surgery, we can say that adenoidectomy can be considered an effective therapy in chronic hypertrophic adenoiditis associated with otitis media with effusion.

## REFERENCES

1. Straetmans M., van Heerbeek N., Schilder A., Feuth T., Rijkers G.T., Zielhuis G.A. - Eustachian tube function before recurrence of otitis media with effusion. *Arch Otolaryngol Head Neck Surg* 2005;131:118-123.
2. Stenstrom R., Pless I.B., Bernard P. - Hearing thresholds and tympanic membrane sequelae in children managed medically or surgically for otitis media with effusion. *Arch Pediatr Adolesc Med* 2005;159:1151-1156.
3. Saes S.O., Goldberg T.B., Montovani J.C. - Secretion of middle ear infants - occurrence, recurrence and related factors. *J Pediatr (Rio J)* 2005;81:133-8.
4. Daly K.A., Hunter L.L., Giebink G.S. - Chronic otitis media with effusion. *Pediatr Rev* 1999;20:85-93.
5. Thornval A. - Wilhelm Meyer and the adenoids. *Arch Otolaryngol Head Neck Surg* 1969;90:383.
6. da Costa J.L., Navarro A., Branco Neves J., Martin M. - Otitis media with effusion: association with the Eustachian tube dysfunction and adenoiditis. The case of the Central Hospital of Maputo. *Acta Otorinolaringol Esp.* 2005;56:290-294.
7. Bluestone C.D., Doyle W.J. - Anatomy and physiology of eustachian tube and middle ear related to otitis media. *J Allergy Clin Immunol* 1988;81(5 Pt 2):997-1003.
8. Bluestone C.D., Cantekin E.I., Beery Q.C. - Certain effects of adenoidectomy on Eustachian tube ventilatory function. *Laryngoscope* 1975;85:113-27.
9. Emerick K.S., Cunningham M.J. - Tubal Tonsil Hypertrophy: a cause of recurrent symptoms after adenoidectomy. *Arch Otolaryngol Head Neck Surg.* 2006;132:153-156.
10. Margolis R.H., Hunter L.L. - Acoustic immittance measurements. In: Roeser RJ, Valente M, Hosford-Dunn H. *Audiology diagnosis*. Thieme Medical Publishers 2000;p398.
11. Jerger J. - Clinical experience with impedance audiometry. *Arch Otolaryngol* 1970;92:311-324.
12. Curtin J.M. - The history of tonsil and adenoid surgery. *Otolaryngol Clin North Am* 1987;20:415-419.
13. Sente M. - The effect of adenoidectomy on eustachian tube function. *Med Pregl* 1996;49(1-2):45-7.
14. Sarafoleanu C., Enache R., Sarafoleanu D. - Eustachian tube dysfunction of adenoid origin. *Therapeutics, Pharmacology and Clinical Toxicology* 2010;1(vol XIV):125-129.
15. Školoudik L., Vokurka J., Kalfeř D., Rybníkár T. - Adenoids and otitis media with effusion. *Otorinolaryng. a Foniát., Prague*, 2010;59(2):62-66.