Does modified Valsalva changes tympanogram?
Joana Miguel Costa Carvalho

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Abel Salazar Institute of Biomedical Sciences, University of Porto

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To my family, friends and João, for the unconditional love.
Resumo

Introdução: A otite média com efusão é definida como a presença de efusão no ouvido médio, sem infecção ativa. Esta condição é muito comum em crianças e pode levar a perda de audição, dificuldades no desenvolvimento e baixa qualidade de vida. O diagnóstico da otite média com efusão baseia-se na realização de otomicroscopia complementada com estudos audiométricos – audiograma e timpanograma. O tratamento desta patologia não é consensual, englobando cuidados médicos e cirúrgicos. A manobra de Valsalva é uma técnica de autoinsuflação que abre a trompa de Eustáquio ao aumentar a pressão no nariz através de uma exalação forçada, favorecendo a drenagem da efusão. Acredita-se que a autoinsuflação seja um tratamento alternativo benéfico da otite média com efusão. No entanto, as crianças têm dificuldade em realizar a manobra, portanto, existem alguns dispositivos que as ajudam a executá-la.

Objetivos: Avaliar se uma única manobra de Valsalva modificada produz alterações na pressão do ouvido médio.

Métodos: Foi realizado um recrutamento transversal consecutivo em crianças dos 3 aos 9 anos avaliadas na consulta de Otorrinolaringologia - Centro Hospitalar Universitário do Porto – de Janeiro a Março de 2019, depois de aplicados critérios de seleção. A idade, número de irmãos, tabagismo passivo, história de atopia/alergia, comorbilidades, frequência de infantário, tipo de amamentação, roncopatia, cirurgia orofaríngea ou nasal, atraso no desenvolvimento da fala e grau de audição foram interrogados, através de um questionário, aos cuidadores. A otomicroscopia e a timpanometria realizadas antes e imediatamente após a manobra de valsava modificada foram avaliadas. A timpanometria foi reportada como uma variável dicotômica (alterações de timpanograma B/C2 para C1/A sim ou não) e contínua (pressão de pico no timpanograma). O estalido e a dor foram registados.

Resultados: Foram estudadas 44 crianças (idade média de 5,9 ± 1,73 anos; 52,3% do sexo feminino). 77% das crianças tinham mais de 5 anos. A maioria das crianças apresentou história positiva para tabagismo passivo (61,4%), roncopatia (75%) e condição atópica / alérgica (61,4%). Antes da autoinsuflação, 54,5% dos ouvidos direitos e 52,3% dos ouvidos esquerdos apresentavam timpanogramas tipo B ou C2. Imediatamente após a autoinsuflação, 25% dos ouvidos direitos e 27,3% dos ouvidos esquerdos mudaram de tipo B ou C2 para timpanograma tipo C1 ou A. O pico de pressão mediana pós-autoinsuflação (15 ± 122 daPA) foi estatisticamente diferente dos valores de pré-autoinsuflação (-91,1 ± 137 daPA) (p <0,0001). Em suma, em 68% das crianças, foi possível ventilar o ouvido médio em pelo menos um dos ouvidos com este novo
método. Houve uma boa correlação entre as otomicroscopias e os timpanogramas pré-autoinsuflação.

Conclusão: O presente estudo é um dos pioneiros a avaliar a mudança do timpanograma apenas com uma manobra de autoinsuflação.

**Palavras-chave**

Otite média com efusão; Manobra de Valsalva; Défice de audição; Timpanometria
Abstract

Introduction: Otitis media with effusion is defined as the presence of middle ear effusion without active acute infection. This disorder is very common among young children and it leads to hearing loss, developmental concerns and poor quality of life. The diagnosis of otitis media with effusion is based on otomicroscopy complemented with audiometric studies – audiogram and tympanogram. The treatment of this condition is controversial and includes medical and surgical care. Valsalva’s maneuver is a simple technique that opens the Eustachian tube by increasing the pressure in the nose with a forced exhalation, which helps to clear the fluid. Usually, in adult patients, autoinflation is done without the use of any device. Autoinflation is thought to be an alternative beneficial treatment of OME. Children, however, usually find it difficult to make the maneuver, therefore there are some devices that help them to perform it.

Objectives: To evaluate if a single modified Valsalva maneuver produces changes in the middle ear pressure.

Methods: A cross-sectional consecutive recruitment was carried out in children aged 3 to 9 years brought to medical appointment of Otorhinolaryngology – Centro Hospitalar Universitário do Porto – from January to March 2019, after exclusion criteria. Clinical and epidemiological variables were systematically collected a questionnaire to the caregivers, including age, number of siblings, passive smoking, history of atopy/allergy, comorbidities, nursery attendance, breastfeeding, snoring, oropharyngeal or nasal surgery, delayed speech development and hearing loss. Otomicroscopy and tympanometry performed prior and immediately after autoinflation, using a modified autoinflation device, were evaluated. Tympanometry was used as the primary outcome and we reported it as a dichotomous variable (changes from B and C2 to C1 or A tympanogram yes/no) and as a continuous variable (tympanogram peak pressure). “Ear pain” and “ear clicking” were registred.

Results: 44 children were studied (mean age of 5.9 ±1.73 years; 52.3% females). 77,3% of the children were older than 5 years. Most children presented a positive history for passive smoking (61,4%), snoring (75%) and atopic/allergic conditions (61,4%). Before autoinflation, 54.5% of the right ears and 52.3% of the left ears presented tympanograms type B or C2. Immediately after autoinflation, 25% of the right ears and 27.3% of the left ears changed from type B or C2 to type C1 or A tympanogram. The post autoinflation median pressure peak (15 ±122 daPA) was statistically different from the pre-autoinflation values (-91.1 ± 137 daPA) (p<0.0001). Overall,
in 68% of children it was possible to ventilate the middle ear in at least one ear with this new method. Otomicroscopy correlated very well with the pre-autoinflation tympanograms.

Conclusion: This study is one of the first attempts to evaluate the change of the tympanogram only with a self-inflating maneuver.

Keywords:
Otitis Media with Effusion; Valsalva Maneuver; Hearing Impairment; Tympanometry
**Abbreviations**

AOM – Acute Otitis Media

CHUP – Centro Hospitalar Universitário do Porto

ENT – Ear Nose and Throat

MEE – Middle Ear Effusion

MEP – Middle Ear Pressure

MVM – Modified Valsalva’s Maneuver

OME – Otitis Media with Effusion

ORL – Otolaryngology

QoL – Quality of Life

URI’s – Upper Respiratory Infections
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**Introduction**

Otitis media with effusion (OME), also known as ‘glue ear’, is defined as the presence of middle ear effusion (MEE) without signs or symptoms of acute infection.\(^1\)\(^2\) OME becomes chronic if it persists for more than 3 months from the date of onset or diagnosis.\(^2\)

The best methodology for estimating OME prevalence and incidence is population screening, concerning its absence of symptoms.\(^3\) The combination of acute otitis media (AOM), OME and their sequelae is significant, especially in the first five years.\(^4\)

The association between OME and long-term outcomes such as conductive hearing loss, poor school performance, behavioral problems and reduced quality of life (QoF) is well established.\(^5\)

Hearing loss is an important cause in speech and development delays in the first years of life, which can be prevented if promptly identified.\(^6\)

The pathogenesis of OME is multifactorial, involving the adaptive and native immune system, Eustachian tube dysfunction, viral and bacterial load, and genetic and environmental factors. Commonly, MEE occurs during an upper respiratory infection or as inflammatory response succeeding AOM.\(^2\) The high incidence of OME in the first year of life may be explained by the immature Eustachian tube structure and function as it is shorter and more horizontal, along with an immature immune system. Consequently, the ventilation and protection of the middle ear against MEE is lesser in children.\(^7\)

Risk factors for OME have been broadly studied and well-established including ethnicity, breastfeeding practices, allergic rhinitis, snoring and exposure to tobacco smoke.\(^8\)\(^–\)\(^10\) Children in daycare attendance, and those having siblings, are also prone to a higher risk, explained by the increased incidence of upper respiratory infections (URI’s).\(^8\)\(^,\)\(^11\) The high prevalence of OME in children with cleft palate\(^12\) or Down’s syndrome\(^8\) is due to Eustachian tube dysfunction.

Otomicroscopy has a much higher specificity on the diagnosis of OME, which makes it the best confirmative test and its much higher positive predictive value may help to prevent a late diagnosis of OME and severe sequelae.\(^13\)\(^,\)\(^14\) Similarly, tympanometry has a great specificity in cases with MEE, reflecting the increase in impedance in the propagation of the sound through the tympanic-ossicular chain.\(^15\)

OME followed by an episode of untreated AOM has 59% resolution by 1 month and 74% resolution by 3 months, whereas those with newly diagnosed OME have resolution rates increasing from 56% by 3 months to 87% by 1 year.\(^16\) The main management options of OME include watchful waiting, medical and surgical care. The observation and educational behaviour strategies are the preferred ones over a period of 3 months before considering surgery.
If OME persists with hearing level worsened and significant impact on a child’s development, myringotomy, with or without tympanostomy tube insertion, in association with adenoidectomy should be offered, if indicated.\textsuperscript{17}

Infrequently, chronic OME can lead to long-term problems due to tympanic membrane retraction, ossicular erosion, persistent tympanic membrane perforation or cholesteatoma.\textsuperscript{18}

There is a considerable amount of literature suggesting autoinflation as a valid treatment for OME.\textsuperscript{19–23} Applying a positive pressure to the Eustachian tube orifice by insufflation of the Eustachian tube can temporarily relieve negative middle ear pressure.\textsuperscript{24} The Valsalva maneuver, a self-inflation method, involves forced nasal expiration with the nose and lips sealed. Politzer’s method of inflation involves the insertion of the tip of a rubber air bulb into one nostril and compression of the other nostril, squeezing the rubber air bulb while the patient swallows to assist in tubal opening. Data reported the reduced need for insertion of ventilation tube in the short term, but also in the long term, using this treatment.\textsuperscript{25} Autoinflation may be used in other situations, such as the treatment of aerotitis media in adults using a Politzer’s device.\textsuperscript{26}

The children who are most affected by this condition are not able to perform the Valsalva maneuver, hence there are several devices for this purpose, the best known being the Otovent.\textsuperscript{20} The Otovent device is a simple conjugation of the Politzer’s device and the Valsalva maneuver. It includes a pump to produce a modified Politzer maneuver conducive to improve middle ear ventilation, a balloon to regulate the pressure, a security valve to prevent higher pressures and a teddy bear embracing the pump to make it more pleasing. However, the compliance in young children with this device is not totally satisfactory.

In this study, the device tested allowed children to do the maneuver without nasal compression – the autoinflation was achieved by the mouth – thus the name, modified Valsalva.

The aim of this study is to determine whether a single modified Valsalva maneuver produces changes in the middle ear. Moreover, it would help to evaluate the lack of evidence on nonsurgical treatments in OME and suggest autoinflation as an option to prevent surgery, which should be performed during the watchful waiting.
Materials and methods

This is an institutional, clinical, cross-sectional consecutive recruitment performed in children between 3 and 9 years old, who went to the ORL medical consultation, in CHUP, between January and March 2019, regardless of the presence or absence of OME. Children with AOM/URI’s, tympanic perforation, ventilation tubes, craniofacial syndromes, autism, and non-cooperating were excluded.

Written consent and participation sheet information was given to all the caregivers before the interview. Semi-structured interviews were conducted face-to-face at the end of the medical consultation, lasting less than 10 minutes. A questionnaire was also performed to the children’s caregivers. It included clinical and epidemiological variables such as sex, age, number of siblings, passive smoking, parents and children history of atopy/allergy, upper airway infections, comorbidities, age of nursery attendance, breastfeeding, snoring, oropharyngeal or nasal surgery, medication, delayed speech development and hearing loss, as seen in Table I.

Otomicroscopy was performed to verify the normality, retraction or effusion of the tympanic membrane. After otomicroscopy, a tympanogram was obtained as an indirect measure of middle ear pressure and a cross-check to otomicroscopy diagnosis. Children were proposed to do the MVM. The apparatus consisted of an inflatable facemask covering the nose and mouth, a T-shaped junction tube connecting to the other inflatable mask and a balloon between the two masks. To prevent air leakage, parents were able to help the child to adapt the facemask during MVM. The chosen balloons provided opening pressures of 60 cm H₂O. If children referred symptoms such as cracking sound in ears, transient pain or visual balloon inflation, the occurrence of middle ear ventilation was considered.

To examine the resultant change in the middle ear, tympanometry and otomicroscopy were repeated after the MVM. Tympanometry and otomicroscopy were performed by a certified technician and otolaryngologist, respectively. A Grason–Stadler GSI 33, Middle-Ear Analyzer was used in the study as a tympanometric equipment, with a probe frequency of 226 Hz. The results were registered in a previous elaborated form. The pathologic tympanograms were represented by type B (defined with a flat curve or MEP ≤ -400 daPa) and type C2 (defined with pressure between -399 and -200 daPa). Type C1 and A were defined with pressures from -199 to -100 daPa and -99 to +200 daPa, respectively. These values are according to the Jergers’ classification.

The main outcome was to verify improvement in tympanogram (to type C1 or A) with a single maneuver. The maneuver was considered efficient if inflation would rise at least 15 daPa.

All reported P values are two-tailed, with a P value < 0.05 indicating statistical significance. Analyses were performed with SPSS version 20.0 (SPSS Inc, IBM Corp, Armonk, NY). Normal distribution was checked using Shapiro-Wilk test or skewness and kurtosis. Categorical variables
are presented as frequencies and percentages, and continuous variables as means and standard deviations, or medians and interquartile ranges for variables with skewed distributions. Comparison of the experimental groups was evaluated with the use of Student t-test or Mann-Whitney U test, chi-square test, or Fisher exact test, as appropriate.

This study was approved by the Ethics Committee of CHUP.
Results

Figure 1 shows the inclusion flowchart of children. From the 67 children brought to the medical appointment, during the time period, 44 were included in the study.

The demographic data of patients are presented in Table II. The average age of children included was 5.9 years, with 77.3% older than 5 years. A female predominance was reported with 23 (52.3%) girls as opposed to 21 (47.7%) boys. Most children presented a positive history for passive smoking (61.4%), sleeping with an open mouth (77.5%) with reference to snoring in 75% of the cases, and atopic/allergic conditions (61.4%), where allergic rhinitis was the most common type, as revealed in figure 2.

At pre-autoinflation otomicroscopy, 50% of the right ears and 47.7% of the left ears had changes compatible with retraction and/or effusion, as well as 54.5% of the right ears and 52.3% of the left ears showed a type B or C2 tympanogram. According to table IV, otomicroscopy correlated very well with the tympanograms pre-autoinflation. Globally, 59.1% of our population had effusion in at least one of the ears.

The Jerger classification of tympanogram changed in 25% of the cases in the right ear and 27.3% in the left ear. The most significant change was C2 and C1 type for A and there was no peak in the vast majority of those with type B tympanogram. This data is revealed in Figure 3 and 4.

As table III shows, there was a statistically significant difference (p<0.0001) between the peak pressure values pre and post-autoinflation in both ears. Type B and cases that have worsened were excluded.

The post-autoinflation median pressure peak (15 ±122 daPa) was statistically different from the pre-autoinflation values (-91.1 ± 137 daPa) (p<0.0001).

The maneuver was more effective in children older than 5 years, which was statistically significant in the right ear (p=0.008), regardless of the prevalence of B tympanogram, which was similar comparing children of both age groups. Comparing both ears, the maneuver had more effect in the left ear (63.6%), contrasting with a 59.1% in the right ear. On average, in 68% of children it was possible to ventilate the middle ear in at least one ear with this method.

The present study demonstrated that the more negative the middle ear pressure was, prior to autoinflation, the greater the pressure change by the procedure, which is evident in figure 5.

For efficient maneuver of the right ear, 21 out of 26 filled the balloon, and in the left side 24 out of 28 also did. Although there was no statistically significant difference, when the maneuver was not efficient, the filling of the balloon was also less frequent.

Transient pain and click in the ears were not statistically significant between those with efficient and not efficient maneuver.
Discussion

We evaluated children who attended an Ear, Nose and Throat (ENT) outpatient clinic, which led us to a population with a high incidence of OME. In response to the questionnaire, the majority of those surveyed indicated a positive history of passive smoking, sleeping with open mouth, snoring and atopic/allergic diseases, describing a typical population of ENT consultation. We noticed that allergic rhinitis was the most prevalent type of allergic condition. This is in line with some authors that concluded a higher prevalence of OME in atopic children and a statistically significant difference in tympanometric measurements among atopic and nonatopic subjects with OME, suggesting the important role of allergy in the genesis and recurrence of OME.27

The maneuver was performed with a modified device consisting of an anesthetic mask covering the nose and mouth, a T-shaped junction tube connecting to the other inflatable mask and a balloon between the two masks. This equipment is novel in a way that it attempts to simplify the procedure, considering not only the difficulty that children find to perform it alone, but also turning it more appealing by placing a balloon.

The maneuver was effective in a vast number of cases, particularly in children with more than 5 years. The single most striking observation to emerge from the data comparison was the change in the peak pressure in both ears pre and post-autoinflation. This result confirms that it is possible to force the opening of the Eustachian tube and ventilate the middle ear with this device.

Interestingly, in the case where the representation of the peak pressure pre-inflating was possible, for more negative values of middle ear pressure, the change in pressure after the procedure was greater. For patients with type B tympanogram, the tympanometer could not register the pre-autoinflation pressure since it was already above 400 daPa. Thus, even though the pressure could change, it would remain higher than what could be graphically represented. For this reason, type B cases were excluded.

There was a significant correlation between the results from otomicroscopy and tympanograms pre-autoinflation. This association may be manly because these exams were made by physicians and technicians, thus, it is a valid way of verifying whether there was effusion/retraction or not.

To ensure the opening of Eustachian tube, we chose a 60-mmHg opening pressure. According to a previous study, the mean opening pressure from children aged 2 through 5 years was nearly the same for children aged 6 through 9 years, but was significantly different than that from children aged 10 through 13 years.28

With our technique, there were only 4 noncooperating children, demonstrating satisfactory compliance that enhances the feasibility of autoinsufflation. Although in a previous review some side effects studied were stated, including the incidence of middle ear infection/effusion,
eardrum perforation, upper respiratory tract infections and tonsillitis, in our sample we didn’t report any complications related to the procedure. Still, it should be noted that the maneuver was performed only once.

Even though recommendations and outcomes of this type of treatment are not well established yet, there is some evidence that it can reduce the need for insertion of ventilation tubes, not only in short term but also in long term. The effects of autoinsufflation may be determined with aspects such as follow-up time, duration of treatment and the device used, considering it as an option whilst awaiting natural resolution of OME. Information about the risks and benefits of all types of treatment should be made available to ensure that parents are provided with the information needed to answer the questions about OME treatment options that are likely to have in order to improve the parental satisfaction and treatment adhesion.

It is plausible that several limitations may have influenced the results obtained. First, the data was recorded during routine medical care, therefore, interpretation is limited by the accuracy and consistency of the source records, in this case, the caregivers’ answers. An additional possible source of error is the small sample size as it may interfere with the results. Given that our conclusions are based on a limited number of children, the results from such analyses should thus be treated with considerable caution. Nevertheless, in our view the results emphasize the validity of autoinflation.

Further research is needed to corroborate the efficacy of the autoinsufflation for strategy management of OME, especially when it comes to long-term effects. It could also include investigation about whether autoinflation has an influence in preventing disease relapses in children predisposed to OME, or identification of subgroups of children for whom this treatment could be recommended by finding predictive factors.
Conclusion
OME is a common medical condition among young children and an important cause of hearing loss. The only proven treatment is invasive, and it is never suggested before 3 months of installed disease, therefore, there is a need for something effective in this watchful time. In this study, we concluded that middle ear pressure can change with only one MVM. In cases with type B tympanogram, it was difficult to evaluate the results of a single self-inflation, although we believe that with regular use, we could achieve positive outcomes. According to previous studies, the compliance with the technique is easy to achieve and there are a few reported complications using autoinflation.
Because of the large number of children affected by this condition, as well as the several underlying factors in the development of this condition, further studies following a larger number of children with a long follow-up time are required, in order to evaluate long-term outcomes.
Appendix

Figures.

67 children in the medical appointment

23 excluded children:
4 non-cooperating
5 with AOM/URI's
5 with perforated membrane
3 with craniofacial syndromic/autism
6 with ventilation tubes

44 evaluated children

Figure 1. Inclusion procedure
Figure 2. Type of allergic/atopic conditions

- Asthma: 24%
- Allergic Rhinitis: 49%
- Atopic Skin: 22%
- Food allergy: 5%
Figure 3. Comparation of tympanograms according to Jerger’s Classification in the right ear pre and post-autoinflation.
Figure 4. Comparison of tympanograms according to Jerger’s Classification in the left ear pre and post-autoinflation
Figure 5. Variations in peak pressure

$y = -0.5243x + 83.883$

$R^2 = 0.3376$
**Tables.**

Table I. Caregiver’s Questionnaire

<table>
<thead>
<tr>
<th>Question</th>
</tr>
</thead>
<tbody>
<tr>
<td>Number of siblings</td>
</tr>
<tr>
<td>Passive smoking</td>
</tr>
<tr>
<td>Parent’s history of atopy and allergy</td>
</tr>
<tr>
<td>Age of nursery attendance</td>
</tr>
<tr>
<td>Oropharyngeal and nasal surgery</td>
</tr>
<tr>
<td>Upper airway infections</td>
</tr>
<tr>
<td>Sleep with open mouth</td>
</tr>
<tr>
<td>Snoring</td>
</tr>
<tr>
<td>Type of nutrition during the first 6 months</td>
</tr>
<tr>
<td>Atopic/Allergic conditions</td>
</tr>
<tr>
<td>Comorbidities</td>
</tr>
<tr>
<td>Delayed speech development</td>
</tr>
<tr>
<td>Hearing loss</td>
</tr>
</tbody>
</table>
Table II. Descriptive analysis of the subjects

Characteristics of the evaluated children (*n*=44)

<table>
<thead>
<tr>
<th>Variable</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Age, years (±SD)</td>
<td>5,9 (± 1.7)</td>
</tr>
<tr>
<td>Gender, n. (%)</td>
<td></td>
</tr>
<tr>
<td>Masculine</td>
<td>21 (47.7%)</td>
</tr>
<tr>
<td>Feminine</td>
<td>23 (52.3%)</td>
</tr>
</tbody>
</table>

*Children with positive history of:*

<table>
<thead>
<tr>
<th>Variable</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Siblings, n. (%)</td>
<td>16 (36.4%)</td>
</tr>
<tr>
<td>Passive smoking, n. (%)</td>
<td>27 (61.4%)</td>
</tr>
<tr>
<td>Parent’s history of allergy, n. (%)</td>
<td>23 (52.3%)</td>
</tr>
<tr>
<td>Nursery attendance &lt; 24 months, n. (%)</td>
<td>19 (43.2%)</td>
</tr>
<tr>
<td>≥ 3 URI’s, n. (%)</td>
<td>5 (11.4%)</td>
</tr>
<tr>
<td>Sleeping with open mouth, n. (%)</td>
<td>34 (77.5%)</td>
</tr>
<tr>
<td>Snoring, n. (%)</td>
<td>33 (75%)</td>
</tr>
<tr>
<td>Breastfeeding mainly in the first 6 months, n. (%)</td>
<td>21 (47.7%)</td>
</tr>
<tr>
<td>Atopic/Allergic conditions, n. (%)</td>
<td>27 (61.4%)</td>
</tr>
<tr>
<td>Speech Delay, n. (%)</td>
<td>14 (31.8%)</td>
</tr>
</tbody>
</table>

1See figure II - Type of allergic/atopic conditions
Table III. Comparison of peak pressure in both ears pre and post-autoinflation

<table>
<thead>
<tr>
<th></th>
<th>Pre-autoinflation</th>
<th>Post-autoinflation</th>
<th>p-value</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>RE, peak pressure, daPa, mean ± SD; [min; max]</strong></td>
<td>-89,2±143,7; [-360; 180]</td>
<td>-2,8±137,0; [-320; 175]</td>
<td>&lt; 0,0001</td>
</tr>
<tr>
<td><strong>LE, peak pressure, daPa, median ± IQR; [min; max]</strong></td>
<td>-36,5±237,5; [-325; 125]</td>
<td>65±130,0; [-260; 165]</td>
<td>&lt; 0,0001</td>
</tr>
</tbody>
</table>

RE: right ear; LE: left ear
Table IV. Comparison of diagnosis tools

<table>
<thead>
<tr>
<th>Otomicroscopy</th>
<th>Right ear</th>
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Tympanogram B or C2

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References


