

Prevention and cure of rhinogenous deafness at the Thermal Baths "Bagni delle Galleraie"

A. TOZZI, A. CERVELLERA BLANCASIO, C. BASAGNI, C. RICCI, J. BURZYNSKA*, M.A. BATTAGLIA
Institute of Hygiene in the University of Siena, Italy; *Medical Director Thermal Springs "Bagni delle Galleraie", Siena, Italy

Key words

Rhinogenous deafness • Secretory Otitis Media

Summary

Introduction. Hearing is fundamental for human social life. Secretory Otitis Media (SOM) is the most important cause of transmissive hypoacusis in early childhood.

Methods. The Hygiene Institute in the University of Siena in collaboration with the Thermal Baths "Bagni delle Galleraie" proposed a prevention and cure campaign of rhinogenous deafness in June 2002 in some primary schools in the Colle val D'Elsa district. A sample of 87 children was involved in the study (average age of $5,64 \pm 1,41$ years). On entering the thermal baths a questionnaire was administered to the parents, to point out possible risk factors. Results.

Results. Among the 87 children, 28 cases of SOM and 21 cases of severe tubal disorder were found. Only 19 cases out

of 49 were already known to the parents and only 28 joined the study and were examined for three years consecutively.

Discussion. Out of the 35 children examined in 2002, 28 returned to "The Galleraie" for the two following years. They repeated the thermal cure for two years as a preventive measure. At present they are not affected by SOM and during the winters suffered a lower number of infections in the primary airways and took less antibiotics.

Conclusions. Our study focuses on infant school children because of their critical age for linguistic and social development. Early diagnosis and therapy prevent any negative social development.

Introduction

"Keeping the sense of hearing alert is fundamental if one is not to close oneself in social isolation" [1]. This expression well underlines the importance of hearing in man's life, and the gravity of potential consequences of an undervalued or ignored hearing pathology on cognitive, psychological, personal and social development.

Sound accompanies every moment of man's life and although in certain circumstances it can provoke stress, in most cases it is a source of satisfaction. Think of the pleasure derived from listening to a conversation between friends, music, and the interest aroused by radio, television, theatre [2].

The most important cause of transmissive hypoacusis in early childhood is Secretory Otitis Media (SOM) [3], a disease with multiple origins leading to tubal dysfunction. This disease in the cavity of the tympanum is characterised by the presence of an effusion behind tympanic membrane without its damage. In babies and young children it is second in frequency only to the common cold. A tubal dysfunction seems to be at the basis of such pathology. It is not yet completely known as it establishes itself, sometimes it resolves spontaneously or after any therapy [4]. Such disorder may be functional, linked for example to repeated inflammation in the primary airways which by extension spreads as far as the middle ear; or it may be anatomically linked to the compression exerted by the adenoids on

the tube itself. In children the intrinsic anatomical characteristics linked to age, such as a shorter, wider and horizontal Eustachian tube and not perfectly developed tubal structures such as cartilage, tensor and elevator muscles of the palatine veil and tubal glands, predispose inflammation of the middle ear, as germs climb up easily from the rhinopharynx [5-7].

SOM is considered a type of Middle Effusion (MEE), which is classified as Purulent Otitis Media (POM), both acute or chronic, and SOM [4, 8]. The maximum incidence of Acute Otitis of the Middle Ear and SOM occurs between the first and twelfth month of life, and it decreases progressively with age, down to an average 20% in the third and fourth year, and 4-7% after the sixth year [9].

Acute otitis is promptly diagnosed because of the evident signs and symptoms (fever, earache, irritability), while secretory otitis media is often unobserved because of the absence of pain and vague or silent symptoms. Sometimes the change from auricular fullness, reverberation and tinnitus at low tonalities to a marked loss of hearing is the only alarm. Therefore, if neglected, it is dangerous for long term consequences [10].

Despite a slight loss of hearing, the spontaneous acquisition of language and the structuring of a normal voice are obtained, but difficulties in the articulation of words often appear (dyslalia as uncorrect articulation of certain sounds – phonemes – in the high frequency range and therefore not perceivable) [11, 12].

These children are often regarded as absent-minded, but actually their attitude is linked to their lacking perception of words, leading to a lack of interest in listening. In other words, the child *doesn't follow what he doesn't hear*.

Materials and methods

The Hygiene Institute in the University of Siena in collaboration with the Thermal Baths "Bagni delle Galleraie" near Radicondoli (province of Siena) proposed a campaign for prevention and cure of rhinogenous deafness in June 2002, involving primary schools in the Colle val d'Elsa district. This district was chosen because of the highest population density in the area, having 6 infant schools and 6 junior schools. In the present research 5 junior schools (the first 2 classes) and 4 infant schools were chosen, with a total of 611 children. Choosing randomly one out of five, 120 children between 3 and 7 years of age were invited in the survey; among them 92 accepted to take part in it. But 5 of them were excluded because of existing pathologies included in the exclusion criteria. The average age of participating children was 5.64 ± 1.41 years. On entering the study the parents were filling in a questionnaire about possible risk factors (such as hypoacusis in other members of the family, early onset of the first signs of ear, nose and throat disorders) and about the number of episodes of infection of the primary airways during the winter preceding the study, and on the possible use of an antibiotic therapy.

Table I summarizes sample characteristics regarding: sex, age (3-5 and 6-7 years), pathologies at the initial specialist visit (monolateral or bilateral secretory otitis media, tubal dysfunction, chronic pharyngitis or pharyngotonsillitis), the number of cycles of antibiotic therapy in the preceding year, the influence of the ENT (ear, nose and throat) pathologies on school performance (according to the parents), and the interest declared to participate in the study.

All the children underwent a specialist inspection of ear, nose and throat (ENT) and an acoustic impedance evaluation, while those more able to collaborate went through with an audiometric test.

Exclusion criteria were: neurosensorial hypoacusis, presence of an allergic crisis or previous episodes of allergic asthma, acute rhinopharyngitis and tubal inflammation, and structural/anatomical alterations either congenital or post-traumatic. The children with SOM and marked tubal disorder were proposed a cycle of thermal cures (aerosol and insufflations). The Hot Springs of the Galleraie (whose history goes back to 1862 when they were constructed by Count Bulgarini d'Elci) use slightly sulphureous, sulphated bicarbonate calcic water which comes from five different sources. These mixed waters contain different mineral agents, which should have biological properties equal to each of their biological components. Actually, such properties seem to potenziare each other, generating better than expected single therapeutic effects. Sulphureous waters have a marked antitarrhal action reintegrating the sulphated aminoacids gone lost with the phlogistic

Tab. I. Sample characteristics.

	n. (%)
a) Sex:	
male	43/87 (49.43)
female	44/87 (50.57)
b) Age (years):	
3-5	40/87 (45.98)
6-7	47/87 (54)
c) ENT status at the first specialist visit:	
Normal ENT	33/87 (37.93)
Children with a pathology of the ear:	
total	49/87 (56.32)
SOM bilateral	23/87 (26.44)
SOM monolateral + tubal dysfunction contralateral	5/87 (5.75)
Marked tubular dysfunction	21/87 (24.14)
Children with pharyngitis:	
Chronic pharyngitis	5/87 (5.75)
Average age of onset of ear, nose, throat pathologies (months) (average \pm SD)	32.11 \pm 13.25
d) Cycles of antibiotic therapy in the last year	
1 to 3	49/87 (56.32)
> 3	38/87 (43.68)
e) Influence on scholastic performance	
no one	48/87 (55.17)
some troubles	2/87 (2.30)
significant changes	37/87 (42.53)
f) Reasons for adhesion to the study	
control	41/87 (47.13)
children with frequent pharyngotonsillitis	20/87 (22.99)
children with frequent otitis or apparent hypoacusis	26/87 (29.89)

secretions. They have eutrophic properties due to the stimulation of the cellular metabolic activity, and a direct vasoactive effect with a reduction of the inflammatory congestion [13]. Moreover, these sulphureous waters improve the mucociliary clearance and the production of secretory immunoglobulins [14]. The sulphated waters, on the other hand, have pharmacological properties in common with the sulphureous ones, but a less effective mucolytic capacity [14]. The bicarbonated waters are able to decongestion nasal mucus, inducing constriction of the precapillary sphincters and the opening of the arterial-venous shunt [15]. The mixed waters of the hot springs of the Galleraie have, then, remarkable cleansing and anti-inflammatory properties, improving mucus characteristics, the ciliary activity and the concentration of secretory IgA [14, 16]. Considering children difficulties in blowing their noses, nasal washes were given every day before starting the

treatment cycle; they used micronised nasal douches with physiological solution (not the thermal water), because it is more easily tolerated by young children. Straight after having the nasal wash, the children were given aerosol treatment with thermal water (tiny particles of 2-5 micron are able to penetrate deeply into the respiratory system). About 10-15 minutes after the aerosol treatment, they were given insufflation by the so-called Politzer manoeuvre, consisting of the patient swallowing with closed nostrils while being given positive pressure insufflation, whose efficacy is already known [17-21]. The children underwent an ENT (ear/nose/throat) control and audiometric and acoustic impedance tests at half way through and at the end of the treatments.

Tab. II. Risk factors.

Predisposing factors	n° of cases among children with ear pathologies	n° of cases among children without ear pathologies	χ^2
a) weeks of gestation:			
brought to term	39/49	33/38	0.9
premature	10/49	5/38	
b) type of lactation:			6.54**
maternal	30/49	20/38	
mixed	10/49	16/38	
artificial	9/49	2/38	
c) family history of hypoacusis:			3.6
positive	13/49	4/38	
negative	36/49	34/38	
d) family history of allergies:			8*
positive	25/49	8/38	
negative	24/49	30/38	
e) family history of allergic asthma:			10.0*
positive	12/49	1/38	
negative	37/49	17/38	
f) family history of diabetes:			0.1
positive	7/49	6/38	
negative	42/49	32/38	
g) exposure to passive smoking:			10*
positive	37/49	16/38	
negative	12/49	22/38	
h) ogival palate:			2.09
positive	21/49	10/38	
negative	28/49	18/38	
i) n° of primary airway infections/year (in 1st year of study):			8.7*
> 4 infec/year	30/49	11/38	
from 1 to 4 infec/year	19/49	27/38	
j) attendance of nursery school:			6**
positive	5/49	12/38	
negative	44/49	26/38	
k) otitis episodes in first year of life:			1.58
positive	10/49	4/38	
negative	39/49	34/38	

*p < 0.001; ** p < 0.05

Results

28 cases of SOM (23 bilateral and 5 monolateral) and 21 cases of marked tubal disorder were found in the sample (87 children). Only 19 cases (out of the 49 affected by ear pathology) were already known to the parents. In the other 30 cases the children had not undergone specialist visits in spite of the fact that they were affected by acute otitis or recurrent pharyngotonsillitis (3-4 episodes/year), difficulty in breathing through the nose, nighttime breathing mainly by mouth, and snoring. The parents had also noticed that the children were easily distracted, they spoke louder than usual and turned up the volume of the TV. In these children the audiometric tests had shown an average loss of hearing of about 27 dB (20-25%). 10 children have been diagnosed tubal dysfunction and 7 chronic pharyngitis. All the cases of SOM were associated with a remarkable hypertrophy of the tonsils and adenoids. Only 2 children had previously been operated for an adenotonsillectomy.

Out of the 49 children with ear problems, only 35 accepted to undergo the cycle of thermal cures in 2002 (25 affected with SOM and 10 with marked tubal dysfunction); among them 7 didn't get better, 2 refused to collaborate with the cure, 2 interrupted the cure because of the insurgence of acute media otitis and 3 were affected with significant adenoidal hypertrophy (subsequently underwent adenoidectomy operation).

Out of the 35 children followed in 2002, 28 returned to "The Galleria" for the 2 following years and only 5 of them underwent surgery for adenotonsillectomy. All the 28 children repeated the thermal cure for 2 years as a preventive measure. At present they are not affected by SOM. During the winter they suffered a lower number of infections of the primary airways (in the winter preceding the 3 year thermal cure in all 28 cases the children had more than 4 episodes per year); they took less antibiotics (in the year preceding the beginning of the 3 year thermal cure had taken about 3-4 cycles of antibiotic therapy); their school attendance and consequently their performance was improved, and they are now extremely collaborative and sociable children.

The χ^2 -test (with Yates correction) was applied to evaluate the results and the sample was divided into two groups: a) children affected by ear pathology (bilateral SOM, monolateral SOM and contralateral tubal dysfunction, bilateral marked tubal dysfunction) and b) children without ear pathology (Tab. II).

Significant differences were found between children with positive familiar history of allergies, positive fa-

looked (by parents and teachers who spend a good part of the day with the child).

The present research confirms the importance of an early diagnosis and of a specific therapy avoiding any negative social development in the child.

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miliar history of allergic asthma and exposure to passive smoking.

Finally, primary airway infections (> 4/year) predispose to SOM.

Discussion

The association of allergy and SOM is well known, while the association with passive smoking was demonstrated only in recent studies; it certainly plays a fundamental role in respiratory diseases as, causing damage to the physiologic nasal drainage, it compromises the already precarious situation [22-26]. The hypothesis of a predisposition towards allergies in asthma directly correlated to a predisposition to SOM is already known, while diabetes apparently does not have a close relation. On the contrary in the case of neurosensorial hypoacusis, transmissive hypoacusis from SOM or tubal dysfunction, the familiar predisposition has less influence.

In the present research, the following factors do not point out a significant difference:

- a) the weight at birth; only one child showed low birth weight (inferior to 10th percentile);
- b) the cranial circumference (only one child had a reduced cranial circumference);
- c) weeks of gestation (children brought to term or borne prematurely);
- d) otitis episodes in first year of life;
- e) ogival palate: consequence of adenoids hypertrophy, but not cause of SOM.

Our results differ from literature but they could be related to the sample size and a wider sample will be examined in the same district in the future.

Conclusions

The present study focuses on infant school children, considering that period a critical age related their linguistic and social development. This is the time when a child begins to face others and social rules. Partial and superficial experience of the environment can lead to the tendency to isolation, to hostility against those which he cannot understand and to aggressiveness due to insecurity. Although the gravity of the situation depends on the level of hypoacusis, signs such as asking to repeat a word, talking in a loud voice, listening to radio and TV at full volume, constantly bringing the better ear near a person when listening to him/her, staring at the mouth of the speaker, should never be over-

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■ Correspondence: Dott.ssa Angela Tozzi, University of Siena, Department of Physiopathology, Experimental Medicine and Public Health, via A. Moro, 53100 Siena, Italy - Tel. +39 0577 234517.

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