DOCTORAL THESIS

NOVELTIES IN THE CLINICAL AND PARACLINICAL DIAGNOSIS IN MASTOIDITIS

ABSTRACT

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KEY WORDS:
Mastoiditis, cholesteatomatous chronic otitis media, clinical diagnosis, complementary paraclinical investigations, statistical analysis.
INTRODUCTION

Worldwide, the pathology of otitis holds one of the first places in incidence, afferent costs and impact on quality of life. Therefore, there are many studies focused on researching the clinical-anatomical forms of the disease and especially the new diagnostic and treatment methods.

Mastoiditis is an inflammatory process that includes the middle ear and mastoid cells. Most often, mastoiditis occurs as a complication of a chronic otitis media, incorrectly treated. The introduction of antibiotics in the treatment of otitis media reduced the incidence of mastoiditis occurrence as a complication of acute otitis media, from 50% to 0.4%.

GENERAL CONSIDERATIONS

CHAPTER I
MIDDLE EAR ANATOMY

The middle ear is located between the external and internal ear, being carved out in the petro-mastoid part of the temporal bone. It is made up of the following regions:

- tympanic cavity region with the eardrum ossicular system;
- adito-antral-mastoid region (aperture of mastoid antrum and the antral-mastoid cellular system);
- auditory tube.

CHAPTER II
PHYSIOLOGY AND PATHOPHYSIOLOGY OF MIDDLE EAR

The functions of the middle ear are to transform the aerial vibrations that reach the tympanum in pressure vibrations, in the inner ear fluids and to carry out an adaptation of the impedance between the aerial environment and these fluids. CAE directs the sound waves to the middle ear (tympanum, tympanic cavity and ossicular chain).

CHAPTER III
CLINICAL FORMS OF CHRONIC SUPPURATIVE OTITIS MEDIA

III.1. Simple chronic suppurative otitis media
The chronic suppurative otitis media is an inflammatory and progressive disease of the middle ear, characterized by advanced histological changes in the tympanic mucosa, which lose their character of reversibility. The walls of tympanic cavity and the ossicular chain are kept.

III.2. Chronic suppurative otitis media
The otoscopic test will observe the general appearance of the eardrum, perforation place, its sizes, the appearance of the inside mucosa, the presence of polyps or cholesteatoma. Perforation is sometimes difficult to trace, because it is covered by secretions, by crusts (especially in small epitympanic perforation), and the polyp can cover all the duct lumen.

III.2.1. Cholesteatomatous chronic otitis media
Macroscopically speaking, the most common aspect is the circumscribed formation, with cystic appearance, bag shaped with an epithelial matter. The usual starting point is located at the level of external attic, the externalization of the formation being made through Shrapnell’s membrane or through a posterior-superior marginal perforation.
The activity of the cholesteatoma upon the surrounding anatomical structures manifests itself through a process of destruction and bone resorption with both histological changes with a dominance of the osteoclasts activity and the release of enzymes such as collagenase, protease, phosphatase (105,143,161).

CHAPTER IV

CLINICAL DIAGNOSIS OF MASTOIDITIS

IV.1. Clinical diagnosis of acute mastoiditis
The tympanum aspect is of extreme importance for the diagnostic, therefore the tympanic membrane should be well highlighted by a careful otoscopy, the duct vacuuming and repeated cleaning. The tympanum presents changes in shape, color and surface. It is congested, infiltrated and bulged. The perforation is small and placed on top of a protuberance located in the posterior-inferior and posterior-superior quadrant (75,110,121).

IV.2. Clinical diagnosis of chronic mastoiditis
The symptomatology of the chronic suppurative mastoiditis is clinically “removed” and is manifested by the draining ear or ear suppurative syndrome (purulent, piosanguinolent or fetid draining ear), the presence of the eardrum perforation in Shrapnell’s membrane or in the posterior-superior quadrant, of marginal type and a more or less important erosion of the attic wall. On aspiration, the purulent secretions are easily recovered.

CHAPTER V

METHODS OF PARA CLINICAL EXPLORATION IN OTOMASTOIDITIS

V.1. Bacterial examination in otomastoiditis
If between 1945-1960 the gram-positive flora used to prevail, in the last decades the microbial flora has changed, being currently represented by pyocyanic, bacillus proteus, golden staphylococcus, enterobacter, haemophilus, sometimes hemolytic species and Branhamella catarrhalis. The microbial association has been reported in 25-30%, and the concomitant presence of the anaerobic germs is also mentioned by authors in 8-10% of cases.

V.2. Histopathological examination in otomastoiditis
The acute suppurative otomastoiditis is an empyema or an abscess of the mastoid apophysis with the lysis of intracellular septa. Chronic otomastoiditis consists in osteitis lesions, septic osteonecrosis, the presence of inflammatory granulomas or a diffuse inflammatory hyperplasia or cholesteatoma being of interest for the andro-mastoid area.

V.3. Liminary tonal audiometry
It aims at setting the auditive threshold for the main frequencies in the human hearing range. This threshold is set for the air transmission means and also for the bony means.

V.4. Imaging explorations in otomastoiditis
V.4.1. Conventional radiology
It presents the advantages of a simple and cheap investigation that can be made by standard radiologic equipment available in most hospitals. The major disadvantage of the resulting image is represented by the summation in a single plan of the multiple structures situated in different places, thus making difficult the image interpretation.

V.4.2. Computerized tomography
Most of the malformative, traumatic, inflammatory or tumoral disorders affecting the different structures of the temporal bone as well as their intra and extra-temporal extensions (34,41,96) can be diagnosed by the CT.
V.4.3. Magnetic resonance

The diffusion–weighted magnetic resonance can play a major role in assessing the primary cholesteatoma at the medium ear level (98,99,141).

PERSONAL RESEARCH

CHAPTER I

PURPOSE, OBJECTIVES AND MOTIVATION OF THE RESEARCH

This work aims is to analyze the new current trends of clinical and paraclinical diagnosis in otomastoiditis of a group of patients suffering from otomastoidian inflammatory disorders, admitted and treated within the Otorhinolaryngology Clinic of the County Emergency Hospital of Craiova between 2003-2007.

The major problem consists in the ear pathology, especially the acute and chronic otomastoiditis. The experiences up to present show us the existence of some patients with ear disorders who do not react appropriately to the performed treatment or whom rate of recurrence and development of some complications is quite high. These are the problems from which this study arises, following the anatomic variables that offer specificity to the therapeutic plan, in connection with the modern imaging investigations (CT/RM).

CHAPTER II

MATERIAL AND METHOD

The work approaches a retrospective clinical statistics study performed for a 5 years period (2003-2007) on a study group made of 146 patients suffering from acute and chronic ear pathology, admitted to the Otorhinolaryngology Clinic of the County Emergency Hospital of Craiova.

The otorhinolaryngology clinical examination was performed according to the known standards and included oral cavity pharyngoscopy, anterior and posterior rhinoscopy and otoscopy. The auricular examination started with the otoscopy of the healthy ear and continued by examining the affected ear, taking into account some aspects related to the auricular pavilion, the external auditive conduct and the tympanum membrane where the focus was on the changes of color and lustre, the impairment of normal anatomic relief, pathological changes of tympanum surface, thickness and continuity, the impairment of the tympanum mobility.

The exploration of the acoustic function was performed by the tonal audiometry testing the hearing through the pure tones issued by the apparatus. All the patients included in this study were subject to radiographies of the petromastoid region, using Schüller temporal – tympanum incidence, comparatively on both sides, this incidence representing the first examination of the medium ear exploration, especially in the inflammatory processes.

The imaging examination through magnetic resonance was achieved on a number of 32 patients, using specific protocols of the petromastoid region, on three plans, in balance T1 and T2, native and post- gadolinium.
CHAPTER III

RESULTS

III.2. Otomastoiditis incidence depending on the other otorhinolaryngology disorders

Analyzing the patients admitted to the Otorhinolaryngology Clinic of the County Emergency Hospital of Craiova between 2003-2007, we noticed a number of 11375 hospitalizations made because of different disorders, of which a number of 146 patients (1,28%) were diagnosed with otomastoiditis (Table 5, Fig. 28).

III.10. Distribution of patients suffering from otomastoiditis depending on the subjective clinical symptomatology

The starting symptomatology of the acute otomastoiditis was the classic one: othorea, otodynia, hypoacusis, fever, cephalalgia and for the chronic ones, fetid othorea and hypoacusis.

III.13. Distribution of patients suffering from otomastoiditis depending on the anatomical and clinical forms

Table 15. Distribution of patients suffering from otomastoiditis depending on the anatomical and clinical forms.

<table>
<thead>
<tr>
<th>Anatomical and clinical forms</th>
<th>Patients number</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Simple cholesteatoma</td>
<td>5</td>
<td>3.42%</td>
</tr>
<tr>
<td>Suppurative cholesteatoma</td>
<td>55</td>
<td>37.67%</td>
</tr>
<tr>
<td>Simple polypous</td>
<td>7</td>
<td>4.79%</td>
</tr>
<tr>
<td>Suppurative polypous</td>
<td>27</td>
<td>18.49%</td>
</tr>
<tr>
<td>Simple suppurative</td>
<td>32</td>
<td>21.92%</td>
</tr>
<tr>
<td>Cholesteatomas polypous suppurative</td>
<td>20</td>
<td>13.70%</td>
</tr>
</tbody>
</table>

III.16. Distribution of patients suffering from otomastoiditis depending on the complementary paraclinical investigations in order to set the diagnosis

III.16.1. Microbiological examination

From the data acquired pursuant the microbiological examinations, the following germs were identified in this study: Streptococcus pneumoniae in 36.56%, Staphylococcus aureus in 13.43%, Pseudomonas aeruginosa in 11.19%. In a much reduced ratio, there were also registered Proteus mirabilis in 5.22% of cases and Haemophylus influenzae in 6.71% of cases.

III.16.2. Audiometric examination

Liminary tonal audiometry

The tonal audiogram was performed on all the patients in the group (Table 24) and pointed out some hearing changes by air means in the affected area on 48 de patients (32.87%).

In the cases of chronic evolution on long term, there were also pointed out some changes of the bony structure. Thus, for 98 de patients (67.12%) a disorder was registered both by air and bony means.

III.16.3. Radio imaging examination

The classic radiologic examination was performed on all patients, using Schüller temporal tympanum incidence, comparatively on both sides in order to interpret the type of mastoid pneumatization.
The imaging examination by computer tomography was used on 42 patients (28.76%), and the magnetic resonance on 32 of the patients (21.91%), having a great importance in setting the diagnosis of endocranial complications.

III.16.4. Histopathological examinations

On the occasion of surgical procedures, there were sampled some mucous membrane fragments from the medium ear or from the mastoidian cavities level which were sent for examination at the laboratory of pathological anatomy where classic histologic colorations were performed (hematoxylin – eosin and trichrome) and immunohistochemistry colorations.

All the patients were subject to the histopathological examinations of the polype, cholesteatomas or mucous membrane fragments sampled during the surgical procedures.

CHAPTER IV

DISCUSSIONS

IV.1. Features of the yearly distribution of patients suffering from otomastoiditis

The clinical statistical study of the patients group subject to the study showed small variables percentages (16.44%, 19.18%, 17.12%) in 2003, 2005 and 2006; we also noticed a climax of the incidence in 2004, with values of 24.66% and a value approximately equal for 2007, where the value reached 22.60%.

IV.2. Features of the distribution of patients suffering from otomastoiditis depending on age and sex

The age groups most interested in the mastoid suppurative process were those of the people aged 21-30 (29 cases-19.86%) and 51-60 (32 cases-21.92%). For the age groups most affected by the mastoid suppurative process, meaning the young people aged 21-30 and the adults aged 51-60, we found the greatest number of patients belonging to the male gender.

IV.3. Features of the distribution of patients suffering from otomastoiditis depending on the origin and age groups

Taking into account the patients percentage of 60.27% in the urban environment, we noticed that for them the age groups maintain a high incidence as those mentioned at the distribution of patients depending on age, respectively the young adults (21-30 years) and the age group 51-60.

IV.7. Features of the patients suffering from otomastoiditis depending on the objective examination

The purulent, fetid auricular suppuration was joined by a polype or cholesteatoma, but there are also cases when the presence of the purulent suppuration was not pointed out and the patients presented not infected clinical forms.

IV.9. Features of the results obtained by paraclinical investigations

IV.9.1. Analysis of the results obtained by microbiological examinations

Similar to the specialized studies where the most frequent pathogen agent is Streptococcus pneumoniae, with an increasing trend in the last years in other countries, especially on children, of about 28.85% (11,17,18), in this study, Streptococcus pneumoniae (36.56%) is the incriminated germ for the occurrence of infectious complications, too.

IV.9.2. Analysis of the results obtained by audiometric examination

Thus, 21% of patients with transmission hypoacusis presented a loss of 50-55 dB on the serious frequencies and for 17% of patients the loss was of 40 dB. Only on 6% of the patients with transmission hypoacusis, the decibel loss was of 80 dB (Fig. 71, Fig. 72). The greatest loss of acute frequencies was registered on 18% of the patients with mixed hypoacusis who registered a 50 dB loss; on 16% of the patients, the loss on the acute frequencies was of 35 dB (Fig. 74, Fig. 75).
IV.9.3. Analysis of the results obtained by radio imaging investigations

IV.9.3.1. Conventional radiology

Also according to specialized studies, in this work we also noticed a difference between clinical symptomatology and the radiologic aspects, the persistence of the pathological radiologic aspects remaining for a long time after the clinical symptomatology reduction (120,157). That is why, repeated radiological examinations are required.

IV.9.3.2. Computerized tomography and magnetic resonance

Currently, the examinations by computer tomography are taken as an opportune indication before surgical procedures in all cases of otomastoiditis. The intra and extra-cerebral complications of otomastoiditis are well pointed out by computer tomography, so that this imaging method becomes of first intention for assessing the acute otomastoiditis, the intra and extra-cranial complications and for assessing the mastoid cells coalescence.

The examination by magnetic resonance usually takes place after an examination by computer tomography and it is also recommended in the cases of otomastoiditis joined by serious complications, the invasion at the cerebral substance level representing the most important aspect to follow in these cases (142,144,152,161). Also, the association with the angiography and/or venography by magnetic resonance really improves the diagnosis of vascular complications. All these imaging aspects have a special role in approaching correctly the surgery cure.

IV.9.4. Analysis of the results obtained by histopathological examination

The histopathological study emphasized, for 41,10% of the cases of the studied group, a highly changed mucous membrane, made of a keratinized squamous epithelium similar as structure to the epidermis. The epithelium thickness was variable on each case and even from one area to another of the same case.

By means of the immunohistochemical study we tried to emphasize the cells type present in stromal inflammatory infiltrate. Of the present immune system cells, the majority were T lymphocytes, then B lymphocytes and the least present were the macrophages. The cells distribution in the inflamed chorion had a non-homogenous distribution, proving a various distribution of antigens. Moreover, the immunohistochemical study showed that in the chronic otomastoiditis, the cellular immunity seems to prevail.

CHAPTER V

GENERAL CONCLUSIONS

1. Suppurative otomastoiditis represents a chapter always actual due to the generated functional and vital disorders.
2. The age groups most interested in the mastoid suppurative process were represented by the people aged 21-30 and 51-60, with 29 cases (19,86%), respectively 32 cases (21,92%).
3. The patients coming from the urban environment prevailed, being represented by the male gender.
4. The fetid othorea was the common symptom present in all disease forms, joined by the hearing reduction.
5. The clinical forms of suppurative otomastoiditis were represented by epitympanitis (50,34%), meso-epitympanitis (32,87%) and meso-tympanitis (16,78%) focused on the tympanum bony structure.
6. The positive diagnosis established by anamnesis pointed out the chronic ear suppurative disorder on 138 patients (94,52%), the hearing objective and functional examinations emphasized on 48 patients (32,87%) the transmission hypoacusis, with an air curve reduced especially on major and medium frequencies; the mixed hypoacusis
with decibels loss both on major and acute frequencies, was detected on cases with chronic evolution on long term, on 98 patients (67.12%).

7. The investigation of the mastoidian integrity by Schüller classic radiological exam, completed by CT and RMN for the possible exo and endo-cranial complications represented compulsory explorations.

8. Setting correctly the otomastoiditis diagnosis involves an interdisciplinary cooperation, the clinical picture, the histopathological aspect and the imaging aspects compete at the successful therapy of patients suffering from otomastoiditis.

SELECTIVE BIBLIOGRAPHY

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