Chronic otitis media: histopathological changes
A post mortem study on temporal bones

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Abstract. – The temporal bones of 4 deceased individuals, with concomitant chronic otitis media are studied. The various histopathological changes in the middle ear cleft are examined: suppuration, polyps, granulation tissue. The possibilities of spontaneous healing of a perforated TM and the indications of surgical treatment are discussed.

Key Words:
Temporal bone, Middle ear, Infection, Chronic inflammation, Metaplasia, Complications.

Materials and Methods
We have studied the histopathological changes in temporal bones of 4 deceased individuals, with concomitant chronic OM. These patients were donors and agreed during their life to donate post mortem their temporal bones to the House Ear Institute as a contribution to a better knowledge of temporal bone diseases.

We have removed the temporal bones in our usual way.

Introduction
Otitis media (OM) is an infection localized in the middle ear: mastoid, middle ear cavity, eustachian tube. The classification of OM includes:

- OM with effusion, without perforation of the tympanic membrane (TM), due to an increase of fluid in the middle ear cavity, mainly for eustachian tube dysfunction.
- OM without effusion, which is the simple inflammation of the TM, that can evolve towards an infection.

The two conditions may be predisposing agents to a perforation of the TM.

This is a modification of normal anatomy, that let the infectious agents enter into the middle ear cavity. The patient has recurrent or chronic inflammation and infection of the middle ear epithelium and surgical therapy is mandatory.

Results
Clinical features
The inflammation, while often indolent, may at times give rise to serious complications and even cause death. The hearing loss that is a constant concomitant also contributes to the immense socio-economic problem. Chronic OM sometimes, but not always, follows an attack of the acute disease.

The major feature is discharge from the middle ear. Sometimes polyps may occlude the external auditory meatus. The TM is usually perforated in the pars tensa.

Gross appearances
There has been little study of the gross appearances of chronic OM, except at surgery when the examination of the middle ear cleft is limited to the operative field. With the use of the microslicing method a more complete gross examination of the whole middle ear may be carried out post-mortem. An important feature of chronic OM is the variation in the degree and extent of the inflammation. The tubotympanic region is the most fre-
quently involved and mastoid air cells may also be affected. Mucopurulent material often fills the middle ear space in the tubotympanic region and may also be seen within mastoid air cells. In the inflamed regions the mucosa is thickened and congestion may be severe. Granulation tissue formation may be extensive, showing as red thickened areas particularly on the promontory, in the epitympanum, in the round and oval window niches and in the mastoid. The granulation tissue on the promontory mucosa may be of sufficient thickness to protrude through the perforation in the TM. Such a lesion is the common aural polyp presenting clinically in the ear canal.

A variable degree of loss of ossicular bone may be observed. The most frequently affected ossicle is the incus, particularly in the region of its long process, but dissolution of other ossicles may also occur. In post-mortem temporal bones with chronic OM, large surgically produced cavities are sometimes present in the mastoid region. These are the results of operations to remove infected parts of the mastoid to drain the middle ear cleft, and they may or may not be accompanied by evidence of other surgical procedures involving the ossicles, depending on the severity of the “clearance” of the middle ear undertaken by the surgeon. Yellow localized areas seen anywhere in the middle ear cleft are regions of cholesterol granuloma and pearly white patches particularly in the attic are likely to be cholesteatomas, which are frequently present in association with chronic OM.

**Microscopic appearances**

The most characteristic feature of the pathology of chronic OM is the presence of inflammatory granulation tissue (Figure 1). This cellular reaction has two components. On one hand there is the presence of leucocytes characteristic of chronic inflammation, i.e. lymphocytes, plasma cells and histiocytes. On the other hand there is granulation tissue, constituted by newly formed capillaries and by fibroblasts (Figure 2). Granulation tissue formation takes place in the early stages of healing after the inflammatory destruction of tissue. Chronic inflammatory leucocytes and granulation tissue may be found in the middle ear in chronic OM independently of each other. The two forms of cellular reaction are seen together in aural polyps (Figure 3). This lesion is frequently subjected to biopsy in the investigation of cases of chronic OM. The polyp is usually covered by columnar epithelium, which is often ciliated. Sometimes the epithelium is squamous. This may be produced by metaplasia in the middle ear or by irritation of the polyp when it reaches the ear canal. The core of the polyp is made up of chronic inflammatory granulation tissue. Groups of keratin squames accompanied by foreign body type giant cells may be prominent in aural polyps, particularly in the presence of a cholesteatoma of the middle ear. The middle ear cleft is normally lined by a single layer of cubical or columnar epithelium, which may bear cilia. Tos and Bak-Pedersen studied the normal and pathological middle ear epithelia by a whole mount
method, in which the entire mucosa was re-
moved and stained with PAS-Alcian blue. By
this method goblet cells appear as oval to
round, sharply demarcated blue structures on
a pale background. Few goblet cells were
found in the normal middle ear, but in chronic
otitis the numbers were greatly increased
to a level similar to those in other parts of
the respiratory tract. Unlike other parts of
the respiratory tract, including the cartilaginous
portion of the eustachian tube, where tubulo-
alveolar glands containing mucous and serous
elements are present, the middle ear is nor-
mally devoid of glands. Under conditions of
chronic inflammation, however, the middle
ear epithelium comes to resemble the rest of
the respiratory tract by the formation of
glands. They consist usually of a simple
tubule of mucus-producing cells. Gland for-
mation is particularly active in children with
secretory OM. Glandular transformation
may take place in the mastoid air cells as well
as the main middle ear cavity. The secretion
derived from the glands is an important com-
ponent of the aural discharge in chronic OM
(Figure 4). The mastoid air cells show fibrosis
and their bony walls are markedly thickened.
Cement lines in the lamellar bone are numer-
ous and irregular, often forming a mosaic pat-
tern. This indicates the recent active deposi-
tion and resorption of bone as a result of the
inflammatory process. The product of these
preparative processes in the mastoid is a
patchy sclerosis with some cystic cavities rep-
resenting distended air cells. The obliteration
of mastoid air cells as a result of chronic otitis
is referred to as secondary sclerosis. In some
ears the mastoid air cells lack pneumatization
from an early age. This has been ascribed to
inflammatory change, but such an interpreta-
tion has been doubted by others who have re-
garded the sclerosis as primary, perhaps due
to genetic factors. The appearance of the
mastoid in primary arrest of pneumatization
is said to be unlike that following OM, in that
in the former the mastoid air cell system is
small and the bone is diffusely sclerotic.

Discussion

The chronic modifications of the middle
ear cleft, visible in our histological slides,
show the presence of inflammatory granula-
tion tissue (Figure 2) with newly formed cap-
illaries and fibroblasts, sometime with active
suppuration (Figure 4) sometimes with
polyps (Figure 3), but always with variable
degree of metaplasia in the middle ear. In
our opinion, the perforation of the TM must
be closed as soon as possible. In traumatic
perforations, the earlier the closure, the bet-
ter the possibilities of success. The delay in
operation leads to penetration of antigens
and bacteria, that provoke infection and
modifications of the middle ear cleft, with
mastoid involvement. The wait and see policy
is justified in perforation of TM smaller then
2 mm diameter, not in bigger perforations.
As visible in Figure 1, in a big perforation,
the squamous epithelium migrates around the
edge of the TM. The fibroblast try to spon-
taneously close the perforation, but in big
perforations can not do anything but migrate
around the edge of the TM, thus forming a
concentric fibrous layer that impede the normal healing of the TM. Further more, the penetration of epitelium in the middle ear cleft is a great favoring conditions for the developing of a cholesteatomatous OM, with possible severe complications, like labirinthitis, sensorineural hearing loss, facial nerve palsy, meningitis.

References


