Evolutions in our Practice on the Management of the Chronic Ear Diseases through the Years

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Rec date: Feb 24, 2016 Acc date: May 16, 2016 Pub date: May 23, 2016

Abstract
Chronic ear disease is characterized by long standing or recurrent infection of the middle ear. It is usually manifested with permanent or periodical pus drainage from the ear canal and associated with a wide variety of clinical findings that might include a single eardrum perforation of various size, hypertrophy of the middle ear mucosal lining and in some cases the formation of a skin cyst, named "cholesteatoma".

Keywords: Chronic; Ear diseases; Otorhinolaryngology

Introduction
Chronic ear disease is characterized by long standing or recurrent infection of the middle ear. It is usually manifested with permanent or periodical pus drainage from the ear canal and associated with a wide variety of clinical findings that might include a single eardrum perforation of various size, hypertrophy of the middle ear mucosal lining and in some cases the formation of a skin cyst, named "cholesteatoma". Through the years our understanding on the pathogenesis, diagnosis and treatment of middle ear chronic diseases has evolved. Advances in research have leaded us to modify our practices in order to achieve superior functional and lasting results and improve our patient care.

Short Communication
The surgical therapy of chronic middle ear disease is named Tympanoplasty with Mastoidectomy or not, and aims to eradicate the disease from the middle ear cleft and, at the same time, reconstruct the hearing mechanism. The restoration of the hearing mechanism might be performed by either closing the perforation of the eardrum, either reconstructing the ossicular chain, either restoring a well aerated ear cavity. The standard technique for the reconstruction of the tympanic membrane uses the temporalis fascia as a graft. This technique has widely been used since 1957 [1-3]. For the reconstruction of the ossicular mechanism a variety of types of prostheses has been used. The temporalis fascia as a graft has a tendency to become thin and atrophic in the long term. Due to lack of elasticity and resistance to pressure changes in the external ear canal, secondary perforations may also develop.

To overcome this disadvantage, several authors have suggested that the temporalis fascia graft should be strengthened by periostium or replaced by cartilage [4-8]. The long-term results in eardrum reconstruction with cartilage graft have been proven superior to those of temporalis fascia graft, especially in cases with Eustachian tube dysfunction, as the new eardrum is more resistant to retraction. This was supported by the findings of Heermann et al. [9] that reported excellent hearing result with cartilage grafts and furthermore suggested the use of cartilage in strips, so as to avoid any possible deformity of the graft over the long term. The adoption and wide the use of cartilage as a graft during the previous decades has been acknowledged as a major advance in otorlogic surgery. It should be noted that cartilage has been occasionally used in eardrum reconstruction since 1962 but the widespread acknowledgement of its superiority has been a difficult endeavor [3].

In the Otorhinolaryngology Department of the University of Athens we acknowledged early the superior biological properties of cartilage that are particularly useful in various postoperative middle ear conditions, such as infections and increased external ear canal pressure (as in aqualing diving). Moreover we developed a modified technique of cartilage tympanoplasty the Chondrotympanoplasty. When this type of tympanoplasty is combined with intratympanic reconstruction of the middle ear using cartilage, the term 'intratympanic chondroplasty' is used. Depending on the specific area of middle ear reconstruction, intratympanic chondroplasty can be further specified as 'tubal', 'stapes', 'round window, ' etc. In our own experience cartilage has excellent acoustico-mechanical properties and we have been able to obtain excellent hearing results, despite the retraction of the new - reconstructed eardrum in several cases that may very well be attributed to the effect of the mass of the cartilage on the vibrational acoustical properties of the tympano-ossicular system. The unique biochemical and histological properties of cartilage, along with the excellent surgical and audiological results [10-12] has leaded us to suggest that cartilage can be used in eardrum and middle ear reconstruction with remarkable success.

Cholesteatoma and HPV
Our understanding on the pathogenesis of chronic ear diseases, specifically cholesteatoma has also changed through the years. Middle ear cholesteatoma formation is a relatively common disease that affects all nations worldwide and may cause hearing loss and a discharging ear. Although not malignant in nature, cholesteatomas are related to serious complications that may be life threatening [13-17].

The clinical course of cholesteatoma is rather unpredictable, as some cases show an aggressive development with bony erosion of the adjacent structures and significant morbidity, while other cases have a mild, more 'benign' nature. Surgical findings vary enormously, as some cases maintain the cystic form of cholesteatoma even if extending to the mastoid cavity, while others do not maintain the cystic form and expand 'aggressively' into the adjacent tissues. In addition the surgical findings of the cholesteatomas are correlated well with their clinical courses, as those cholesteatomas that had maintained their cystic form in the operation field were less likely to have a history of ear discharge and vice versa. Clinical research on the subject performed in our Department has leaded us to suggest that papillomaviruses may play an important role in the pathogenesis of cholesteatomas. 'Aggressive' cholesteatomas were found to have a characteristic papillary
hyperplasia of the epithelium and marked koilocytosis, while these findings were absent in the non-aggressive cholesteatomas. These histological features of the 'aggressive' cholesteatomas are characteristic of papillomavirus-induced lesions [18].

In line to our findings Bai et al. [19] found the characteristics of HPV-induced lesions in 12 of 35 specimens [34.3%]. In contrast, Chao et al. found only one out of 32 cholesteatomas studied to contain HPV DNA [20]. Moreover, Bergmann et al. suggested that the mere presence of this HPV DNA does not prove an etiological role of this group of viruses in the induction of cholesteatomas [21]. Finally Franz et al. [17] reported low prevalence of detected HPV DNA (1/29 biopsies) in cholesteatomas, suggesting that common HPV types are unlikely to be a causative factor of the infections.

Potential causes for this controversy and discrepancy in study findings may be the fact that in the above research cholesteatomas were not distinguished in aggressive and non-aggressive types. In our study this distinction revealed a high prevalence of HPV presence in the aggressive type not noted in previous research.

Therefore it can be assumed that papillomaviruses may play an important role in the pathogenesis of cholesteatomas. However, the exact role of these viruses in the pathogenesis of the tumors remains unknown and remains to be determined. The large number of different papillomavirus types makes the related research difficult and the fact that there are papilloma viral sequences of as yet unidentified types even more complex. Therefore further studies are needed to explore the potential relationship between papillomaviruses and 'aggressive' cholesteatomas.

**Ossicular Remnants in Ossiculoplasty**

Our own research in cholesteatoma pathogenesis and treatment has also been the cause to modify our approach and practice in ossiculoplasty. For a many number of years acoustic ossicles remnants, autogenously elastic cartilage and allogenous prosthetic material (Titanium, Teflon, etc.) have been used for the ossicular chain reconstruction in mastoid surgery.

In a study of ours [16] we assessed the status of the acoustic ossicles in 114 patients (57 with cholesteatoma and 57 without) subjected to surgery for chronic otitis media using the operating microscope. In 52 cases, the ossicles (malleus and/or incus) were assessed using both the surgical and the scanning electron microscope in order to reveal any erosion, suggesting the presence of otitis. From the 57 operated ears with cholesteatoma, 58% had ossicular erosion whereas 24 (42%) did not. This difference was statistically significant (p=0.02). With regard to the 52 operated cases that were studied with both microscopes, in the cholesteatoma patients the surgical microscope was not able to reveal ossicular erosion in 39% of the cases, whereas the scanning electron microscope revealed moderate or severe erosions in the same ears. It should be noted that the study was not histopathological and these erosions, whether they had epithelial remnants or not, suggested the presence of otitis, that alone made the use of such ossicles inappropriate. Subsequently we concluded that the operating microscope is not reliable enough to determine if ossicular remnants can be used in ossicular chain reconstruction following cholesteatoma removal. That is because there is a considerable risk that epithelia or other cholesteatoma particles remain in the areas of erosions that cannot be seen with the operating microscope. The use of such ossicular remnants may predispose to cholesteatoma recurrence and failure in mastoid surgery. Therefore we suggested that autoclaving or alternative prosthesis may be considered in such cases.

**Conclusion**

The high quality of medical care we enjoy today is built upon years of tireless effort by our predecessors, investigating the causes of and potential treatments for disease. In this endeavor dogma is not an option. Continuous research in the clinical setting is imperative to advance our knowledge and allow us to further improve patient care and the lives of our patients. There is still much work to be done.

**References**


