Different systems for classification of middle ear cholesteatoma

Critical review

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submitted by

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Contents

LIST OF TABLES

LIST OF FIGURES

INTRODUCTION

A cholesteatoma consists of an accumulation of desquamated keratin epithelium in the middle ear cleft or any other pneumatized portion of the temporal bone. The envelope of a cholesteatoma is termed matrix, and desquamated keratin is shed continually by the matrix and forms the central mass of the cholesteatoma, similar to the layers of an onion. Cholesteatomas are classified as congenital or acquired; acquired cholesteatomas are subdivided into primary (attic retraction) or secondary (**Nicoleta and Pop, 2006).**

Sade´ in 1976 classified posterosuperior retraction pockets in four stages according to degree of retraction of tympanic membrane. This staging system is helpful but does not include the duration, presence, or absence of adhesive changes—which relates to reversibility—or other sites **(Jerome ,2007).**

Tos classification for pars flaccida retractions composed of 4 stages depend on contact with malleus with or without outer attic wall erosion and degree of its severity **(Tos 1980).**

In 1999, Saleh and Mills, proposed another classification depending on the extent of the lesion,

ossicular condition and preoperative complication **(Telmesani et al., 2009).**

In 2011 Black and Gutteridge classified cholesteatoma into four stages according to degree of tympanic membrane collapse, presence or absence of hearing loss and presence of necrosis. It proposed the surgical procedure needed for each stage **(Black and Gutteridge, 2011).**

In 2012 Belal et al. suggested TMC staging system of tympano-mastoid cholesteatoma. where (T) for tympanic cavity involvement, (M) for mastoid cavity involvement and (C) for presence of complications **(Belal et al., 2012).**

There is a need for a new concept that is based on tailoring the surgical technique according to the site of the pathology and its extensions. Comparison of clinical and operative studies about tympano-mastoid cholesteatoma always had the problem of finding a ‘’standard’’ to make a meaningful comparison. Terms of small, big, and huge cholesteatomas made comparison between the different studies like comparing apples to oranges. A standard staging system will definitely solve this problem (**Belal et al., 2012).**

AIM OF THE WORK

The aim of the study is to review different systems of classification of middle ear cholesteatoma and apply these staging systems on ten cases of tympano-mastoid cholesteatoma, and correlate them with intraoperative findings to reach the nearest clinical system to the actual intraoperative findings.

Review of Literature

Anatomy of middle ear and pathophysiology of cholesteatoma

A cholesteatoma consists of an accumulation of desquamated keratin epithelium in the middle ear cleft or any other pneumatized portion of the temporal bone. Cholesteatoma has a destructive character, by means of pressure erosion, as it destroys the ossicles, erodes the horizontal semicircular canal, uncovers the facial nerve, exposes dura of the temporal fossa or cerebellum, or causes other serious damage to important structures within or adjacent to the temporal bone (**Nicoleta and Pop, 2006).**

Mucosal Spaces Of The Middle Ear:

The lining of the middle ear spaces is the extension and modification of the respiratory mucous membrane that lines the nasal cavity, nasopharynx and eustachian tube. In all these regions the mucous membrane consists of a layer of ciliated columnar cells with a subepithelial layer of connective tissue. A thin delicate mucous membrane lines the whole of middle ear cavity and is reflected onto the ossicles and tendons. It is continuous with the mucous membrane of the mastoid antrum and Eustachian tube. The mucous membrane is thrown into a series of folds by the intratympanic structure dividing the middle ear into mucosal spaces of surgical importance. The attic is

almost completely separated from the mesotympanum by the ossicles and their folds except for two small but constant opening called isthmus tympani anticus and isthmus tympani posticus **(Kumar et al.,2012).**

The epitympanic space:

is a pneumatized portion of the temporal bone superior to the mesotympanum. "Epitympanic diaphragm" consists of three malleal ligamental folds (anterior, lateral, and posterior), the posterior incudal ligamental fold and two purely membranous folds (the tensor fold and the lateral incudomalleal fold) together with the malleus and incus. From this anatomical point of view it is possible to classify the epitympanum in two different compartments: a larger and posterior one (posterior epitympanic space—PES) and a smaller and anterior compartment (anterior epitympanic space—AES) (Figure 1) **(Palva and Johnsson, 1995).**

The body and short process of the incus together with head of the malleus occupy the majority of posterior epitympanic space. The lateral portion of posterior epitympanum is narrower and it is divided in two further portions by the lateral incudo-malleal fold. They are separated and arranged one above the other: the superior and inferior lateral attic (Figure 1) **(Marchioni et al.,2011).**

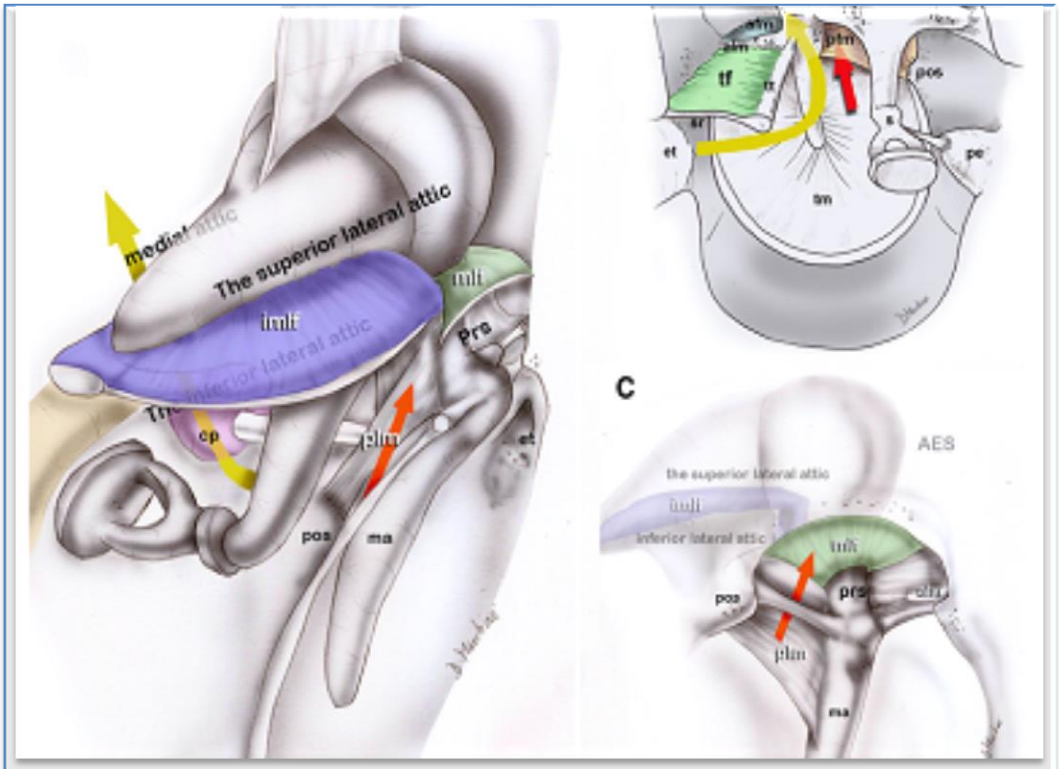

Figure 1: Epitympanic spaces and their ventilation routes. a posterior view; b medial to laterally view; c: lateral view. Long curved arrow ventilation route of the epitympanic-mastoid compartments, short arrow ventilation route of the Prussack space, ma Malleus, in incus, s stapes, cp cochleariform process, AES anterior epitympanic space, PES posterior epitympanic space,pos posterior spine, et Eustachian tube, imlf lateral incudomalleal fold, mlf lateral malleal fold, tf tensor fold, plm posterior malleal ligamental folds, alm anterior malleal ligamental folds **(Marchioni et al.,2011).**

Attic:

The inferior lateral attic:

is bounded superiorly by the lateral incudo-malleal fold and it is located between the short process and body of the incus medially and the medial aspect of the scutum laterally. This

anatomical area is therefore in a lower position to the epitympanic diaphragm and is in communication with the underlying mesotympanum. Mesotympanic region guarantees ventilation of the inferior lateral attic. In a more cranial position lies the superior lateral attic whose inferior limit is represented by the incudo-malleolar fold. This anatomical area together with the medial attic is the so-called superior attic or upper unit.

The Superior attic:

is in communication with the mesotympanum through the underlying tympanic isthmus and posteriorly it is opened to the aditus ad antrum. Its upper limit is tegmen tympani, while the lower one is given by the second portion (intratympanic) of the facial nerve and laterally it is bounded by the lateral bony wall of the Attic. The whole superior attic is ventilated through the isthmus (Figure 2) **(Palva and Johnsson 1995).**

Anterior malleolar space:

The transversely placed superior malleolar fold divides the attic into a small anterior malleolar space which lies above the tensor tympani fold that may prevent cholesteatoma from the attic reaching the anterior mesotympanum and a larger posterior compartment.

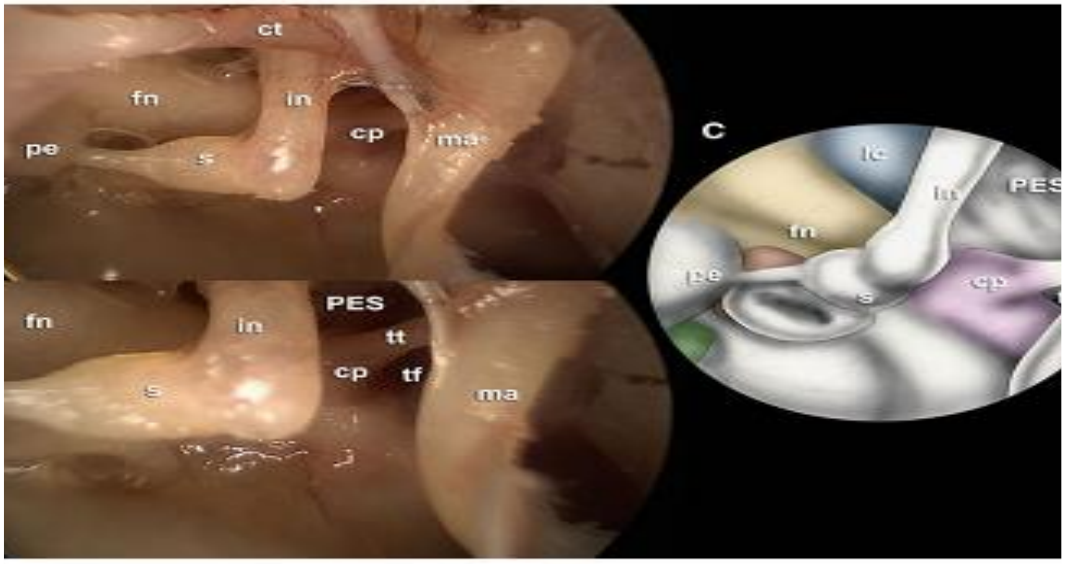

Figure 2: Tympanic isthmus. a magnification of the isthmus with a 0 endoscope; b magnification of the isthmus with a 45 angle endoscope; c scheme of the isthmus. ma Malleus, in incus, s stapes, cp cochleariform process, tt tensor tendon of the malleus, PES posterior epitympanic space, ct corda tympani, tf tensor fold, fn facial nerve, pe pyramidal eminence, lc lateral semicircular canal **(Marchioni et al.,2011).**

The posterior compartment:

is further subdivided by the superior incudal fold into a superior incudal space (lateral to the fold) and a medial incudal space. The entrance into the prussak's space is usually located between the lateral malleolar fold and lateral incudal fold. This latter fold may arrest the passage of cholesteatoma, through a posterior superior marginal perforation, into the attic **(Kumar et al.,2012).**

The interior incudal space: It is limited superiorly by the lateral incudal fold, medially by the medial incudal fold, laterally