SUPRALABYRINTHINE AND INFRALABYRINTHINE PETROUS BONE CHOLESTEATOMA: EXPERIENCE IN TREATMENT IN NATIONAL MEDICAL RESEARCH CENTER OF OTORHINOLARYNGOLOGY, RUSSIA

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ABSTRACT

Aim: *The aim of this article is to discuss the surgical tactic of supralabyrinthine and infralabyrinthine petrous bone cholesteatoma.*

Study Design: *Retrospective analysis has been conducted.*

Setting: *National Medical Scientific Center of Otorhinolaryngology FMBA (Russia).*

Materials and Methods: *A total of 28 patients (30 surgeries) were included in the retrospective study. The canal wall down (CWD) transmastoid approach was used in 10 cases and combined CWD with middle fossa approach was performed in 3 cases (27%) in patients with supralabyrinthine and supralabyrinthine apical PBCs. The infralabyrinthine retrofacial approach was used in 4 cases (27%). After CWD procedure, the combined infracochlear approach using micro-, endoscopic technique was applied in 3 cases (20%). The combined transcochlear approach was used in 6 cases. In two cases with extensive destruction of internal auditory canal (IAC) (13%) we had to perform translabyrinthine approach.*

Results: *Good functional results were obtained: hearing preservation in 11 patients; postoperatively 9 patients with facial nerve palsy retained the same grade or improved; lower cranial nerve function was preserved in all cases, even if both parts of the jugular foramen were destroyed. Recurrence and residual cholesteatoma were seen totally in 5 cases, which were reoperated later on without signs of recidivism. The mean duration of a follow-up was 18 months.*

Conclusion: *Surgical planning based on precision study of preoperative CT data, taking into account the peculiarity of localization and extension of the process, and presence of middle cranial fossa (MCF) defects allows to successfully eliminate the pathological process with the possibility of minimizing injuries of vital structures and to get reliable closure of bone defects between the postoperative cavity and MCF. Preservation of the auditory function in patients with supralabyrinthine and infralabyrinthine cholesteatoma is possible in less than half percent of cases.*

The use of video endoscopic assistant, monitoring of the cranial nerves is mandatory and in some cases allows to preserve the hearing and facial nerve function, visualize and prevent injuries of V, VII, IX–XII pairs of cranial nerves.

Keywords: *skull base surgery, supralabyrinthine cholesteatoma, facial nerve*

INTRODUCTION

Petrous bone cholesteatomas (PBCs) are slow-growing epidermoid cysts, which are the result of the uncontrolled silent growth of the epithelium and affect the petrous part of the temporal bone (1). Frequency of cholesteatomas: 3 per 100,000 children; 9.2 per 100,000 adults (1.4 times more likely in men), which is 4–9% of all pathological lesions of this localization (2,3). The petrous bone cholesteatoma is a locally aggressive leisure that destroys bone tissue and surrounding structures, and can spread to the middle and/or posterior cranial fossas. In addition, the proximity of the pathological process to the labyrinth and facial nerve jeopardizes both the hearing and the function of the facial nerve (34.6–100%). By origin it can be congenital, acquired or iatrogenic. Petrous bone cholesteatomas tend to be locally aggressive, destroy the bony structures of the temporal bone and the areas surrounding it (clivus, sphenoid sinus, occipital condyle) with rare extension into the nasopharynx, infratemporal fossa and intradural spread (4). The congenital process is more destructive, that is associated with long-term asymptomatic period and initial manifestations in young and middle-aged people with rough clinical symptoms (dysfunction of the facial nerve, deafness, intracranial complications), without history of clinical observation (5,6). All this and frequent recurrences make the treatment of patients with PBCs one of the most difficult in ear pathology.

Classifications of PBC have evolved from the two classes (supralabyrinthine and infralabyrinthine-apical) proposed by Fisch to the additional translabyrinthine category proposed by Bartels, to the five classes proposed by Sanna et al. (supralabyrinthine, infralabyrinthine, massive labyrinthine, infralabyrinthine-apical, and apical), to the seven classes proposed by Moffat & Smith (in addition, 5 classes of Sanna were suggested supralabyrinthine-apical and massive apical cholesteatomas) (7,8,9,10).

The supralabyrinthine and supralabyrinthine apical forms of cholesteatoma are the most common types among the different variants of the PBCs and account for 70% of all the cases.

Surgical treatment of this pathology is one of the most difficult tasks in otosurgery in conjugation with a high risk of damage of vital structures located in this area (inner ear structures, facial nerve, jugular bulb (JB) and internal carotid artery (ICA)). Hearing-saving surgeries can be used for limited PBCs: supra- and infralabyrinthine. However, according to some authors, in most cases, keeping the cochlea intact is not possible. The main purpose of treatment of PBCs today is to ensure the radical removal of the pathological process with complete control and safety for the surrounding important nervous and vascular structures. Timely intervention at an early stage gives the best results to preserve the hearing and the facial nerve (FN).

In this article we publish results of PBC treatment at The Otology and Skull Base Pathology Department, National Medical Scientific Center of Otorhinolaryngology FMBA, Moscow, Russia.

MATERIALS AND METHODS

A retrospective case study was performed on 28 patients diagnosed and treated for PBC from October 2017 until June 2020 at The Otology and Skull Base Pathology Department, National Medical Scientific Center of Otorhinolaryngology FMBA, Moscow, Russia. The age range in our series was from 16 to 69 with a mean age of 39 years. The history of the presentation of the illness, clinical examination findings, audiological and radiological examinations, intraoperative findings were documented.

Pure-tone averages (PTAs) were noted for air and bone conduction, calculated before and after surgery as the mean of four thresholds at 500, 1000, 2000, and 4000 Hz. Air-bone gaps were calculated using air and bone conduction values determined at the same time. The FN function was evaluated using the House-Brackmann scale and electroneuromyography at discharge, 3, 6, and 12 months after surgery. All patients with PBCs underwent preoperative high-resolution CT (cuts 0.6–1 mm) and a cranial MRI (in extensive cases with gadolinium enhancement). The postoperative follow-up period ranged from 5 (2 patients) to 34 months with a median of 18 months. All patients also underwent an annual radiological follow-up (the first MRI examination 5–10 months after surgery) for detection of any residual cholesteatoma or cholesteatoma recurrence. Patients with MCF defects additionally underwent CT to evaluate the position of the osteomatrix or autobone graft, osseointegration on day 3–5 and 1 year after surgery.

During this study we used the classification suggested by Moffat Smith in 2008 and divided all patients into 2 groups and 4 subgroups: 1a subgroup—with supralabyrinthine (10 patients), 1b subgroup—supralabyrinthine apical (3 patients), 2a subgroup—infralabyrinthine (10 patients), 2b subgroup—infralabyrinthine apical PBC (5 patients). The patients in these groups had different levels of hearing, FN function, performed surgical approaches and outcomes of the disease (*Table 1*).

Table 1. Surgical management in different types of supralabyrinthine petrous bone cholesteatoma processes.

№ of Patients	Type of Process	Type of Surgical Approach	Endoscope Assistance	Neuromonitoring of FN	Surgery Ending
1.	C, acquired	CWD	+	+	Cul-de-sac
2.	CA, congenital	CWD	+	+	Cul-de-sac
3.	CA, acquired	CWD	+	+	Cul-de-sac
4.	C, congenital	CWD	-	+	Underlay tympanoplasty; ossicular chain reconstruction with total titanium prosthesis
5.	C, acquired	Combined CWD+MF	-	+	MCF defect closure with osteomatrix plate, T-shaped meatoplasty, underlay tympanoplasty, ossicular chain reconstruction with total titanium prosthesis
6.	C, acquired	Combined CWD+MF	-	+	MCF defect closure with osteomatrix plate, T-shaped meatoplasty, underlay tympanoplasty
7.	C, acquired	CWD	+	+	Cul-de-sac
8.	C, acquired	CWD	-	+	T-shaped meatoplasty, underlay tympanoplasty, ossicular chain reconstruction with total titanium prosthesis
9.	C, acquired	CWD	+	+	Cul-de-sac
10.	C, congenital	CWD	+	+	Cul-de-sac
11.	C-A, congenital	Combined CWD+MF	+	+	Cul-de-sac
12.	C, acquired	CWD	+	+	T-shaped meatoplasty, underlay tympanoplasty
13.	C, acquired	CWD	-	+	T-shaped meatoplasty, underlay tympanoplasty; ossicular chain reconstruction with total titanium prosthesis

This study was approved by Ethics Committee of National Medical Scientific Center of Otorhinolaryngology FMBA, Moscow, Russia.

SURGICAL APPROACHES

The 1st Group—Patients with Supralabyrinthine Cholesteatoma

The canal wall down (CWD) transmastoid approach was used in 8 cases (27%) for patients with supralabyrinthine PBCs in 1a group and in 2 cases from 1b group (*Table 1*). In 2 cases from A group and in 1 case from B group we performed combined approach (transmastoid and middle cranial fossa) for repair of middle cranial fossa defects with size more than 10 mm. The combined approach was performed after subtemporal craniotomy, 4 × 5 cm in size. The revision of the defect between MCF and mastoid and middle cavity was performed from both sides, firstly from the side of the mastoid cavity, then through the trepanation opening after craniotomy. The defect was repaired in multilayer technique using osteomatrix, autobone dust, autocartilage and free autofascial flaps. For defects of less than 10 mm, a plastic defect was performed with auto tissue (fascia, cartilage fragment from the auricle, incus or malleus in cases of their presence) from the side of the trepanation cavity. The sanation of cholesteatoma matrix on the tympanic segment of the FN was performed after partial skeletonization of the FN. When the cholesteatoma destroyed structures of the inner ear, a lab-

yrinthectomy or opening of the cochlea turns along the pathological process were performed after possible mobilization of the FN to identify the louses of the pathological process. In cases of the cholesteatoma extension along the FN to its intracanal part into the internal auditory canal (IAC), a translabyrinthine approach was used with opening of the dura mater of IAC (Fig.1). In cases of detection of destruction of the FN trunk, its reconstruction was performed using the end-to-end technique after mobilization of the nerve's central and peripheral ends (by 3-4 epiperineural sutures).

In cases of IAC destruction by cholesteatoma (7 cases) and active intraoperative liquorrhea, the intracanal, labyrinthine and tympanic segments of the FN were delimited from the cavity by free temporalis fascia flap, the cavity was filled with abdominal fat, the external auditory canal was sutured using the cul-de-sac technique. In cases of destruction of the inner ear structures, the medial wall of the tympanic cavity and/or the area of the semicircular canals were tamponed with automuscle and the tympanic cavity was delimited with a fascial flap.

The 2nd Group—Patients with Infralabyrinthine Cholesteatoma

The combined infralabyrinthine retrofacial approach was used in 4 cases (27%) for patients with infralabyrinthine PBCs in 2a group (*Table 2*). Retrofacial infralabyrinthine approach is limited by the posterior semicircular canal and cochlea superiorly, the jugular bulb inferiorly, and the mastoid part of FN anteriorly. In 1 case we managed to save the posterior wall of the external auditory canal (EAC) (the enlarged posterior tympanostomy was reconstructed with autocartilage plate on the ending stage). Sanation, detailed revision of retro- and hypotympanum and control of surgical field was performed from 3 sides: retrofacial, through the wide posterior tympanotomy, and transcanal. The possibility of using both microscopic and endoscopic techniques during surgery (*Fig. 2.*) played an important role in the total elimination. After the CWD procedure, the combined infracochlear approach using micro-, endoscopic technique was applied in 3 cases (20%) from the 2a group with location of cholesteatoma anterior to the mastoid segment of FN. In the 2a group the hearing was mostly preserved (II–III degree of mixed hearing loss). For the patients tympanoplasty using autofascial graft was performed, as well as the recon-

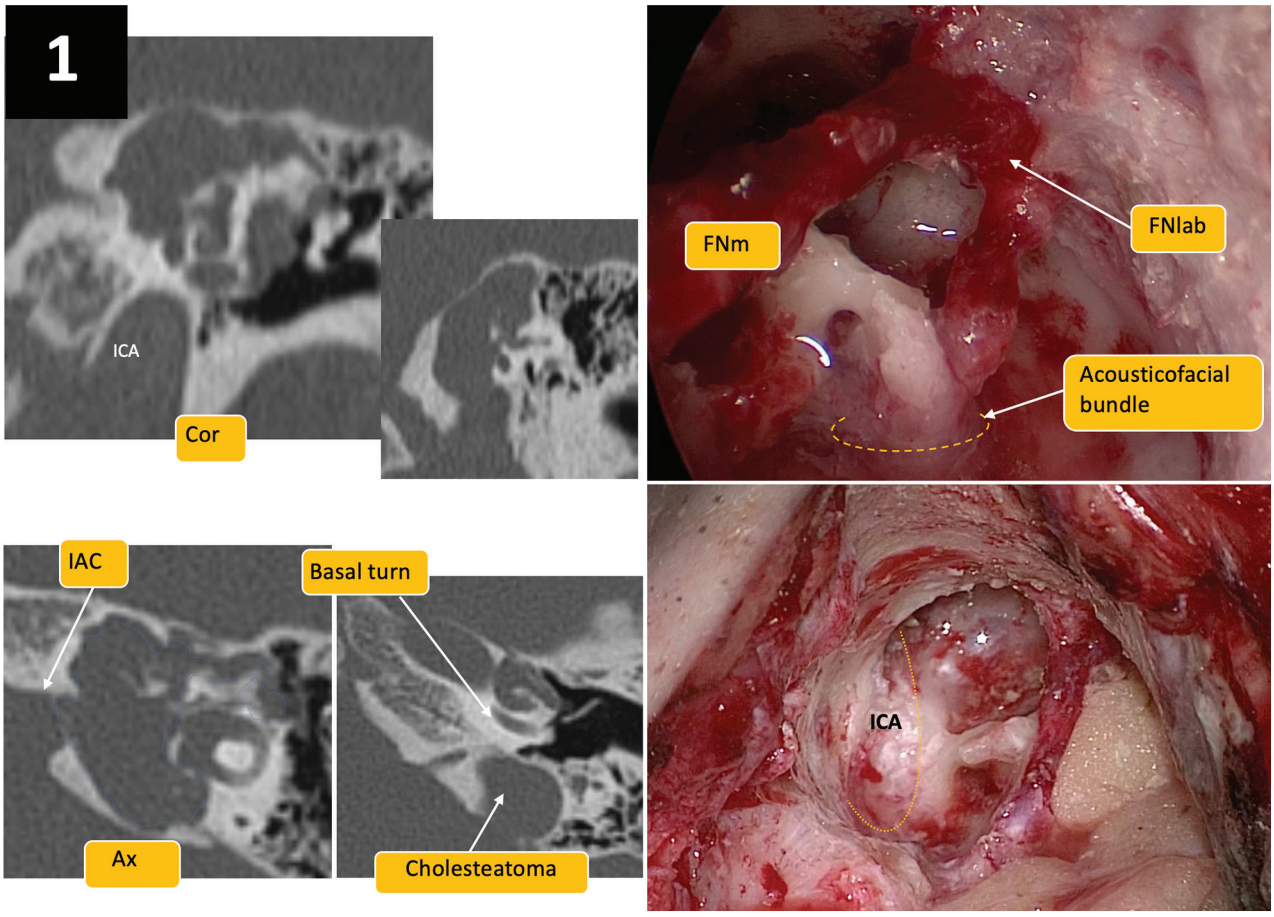


Fig. 1. Supralabyrinthine cholesteatoma: CT scans and intraoperative photos

struction of the ossicular chain by autocartilage or titanium prosthesis and T-shaped meatoplasty at the end of the surgery (if the posterior wall of the EAC was not preserved).

RESULTS

The results of surgery were evaluated in the early and late postoperative period (one year after surgery). The presence of recurrence of cholesteatoma was assessed visually by examining the trepanation cavity and by MRI in DWI mode.

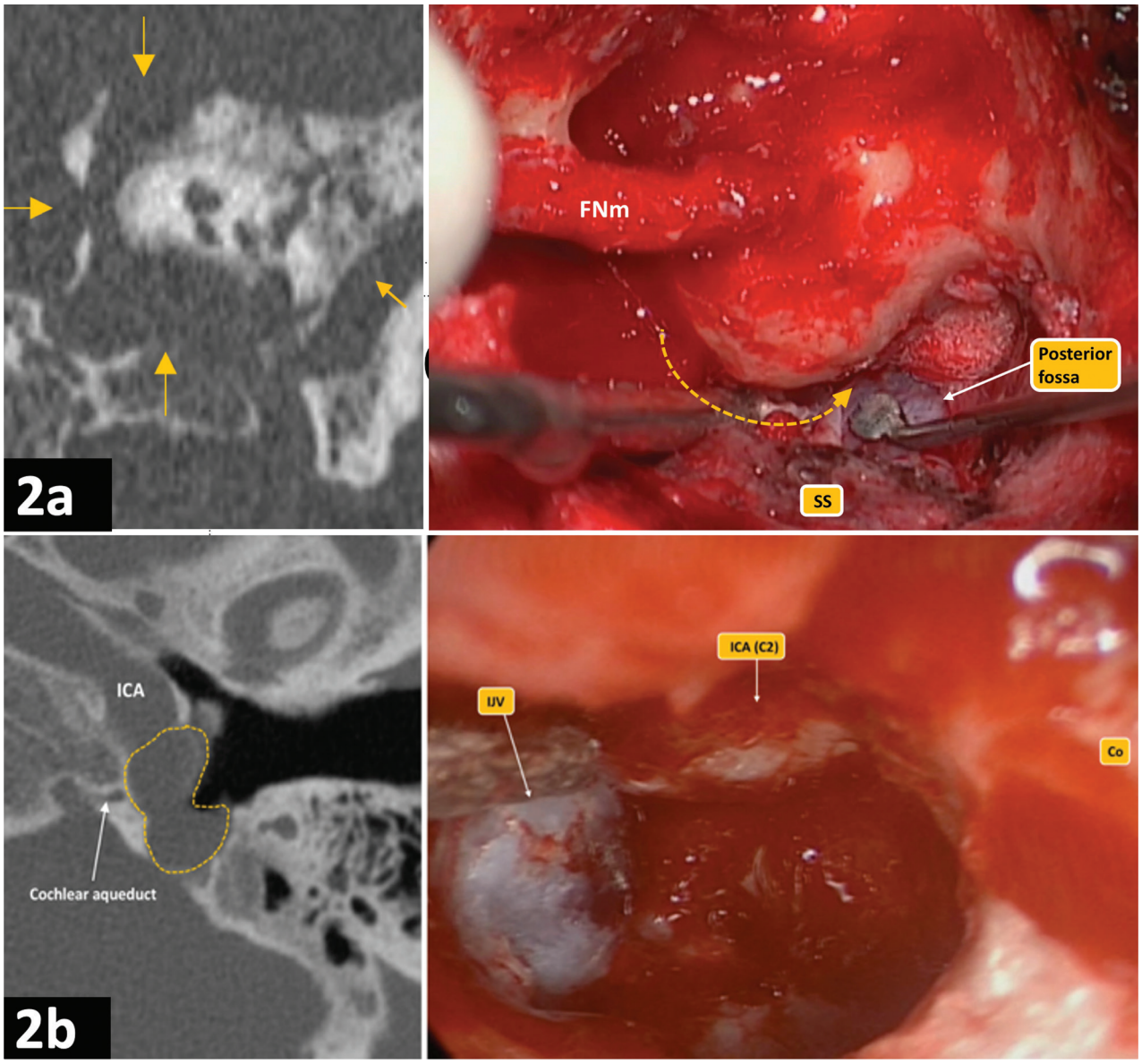


Fig. 2a. Infralabyrinthine cholesteatoma on dura mater of posterior cranial fossa and around semicircular canals. 2b. Infralabyrinthine cholesteatoma with intact cochlea. ICA canal in vertical part(c1) and IJB canal. Cochlea is intact.

The combined transcochlear approach was used in 3 patients with infralabyrinthine cholesteatoma (2a group) and in 3 patients with infralabyrinthine apical cholesteatoma from 2b group (a total of 6 cases—21.4%). A total of 6 patients had cochlea erosion. In two cases with extensive destruction of IAC (7.1%) in 2b group we had to use a translabyrinthine approach.

For 1 patient with infracochlear cholesteatoma and 4 patients with infralabyrinthine apical cholesteatoma the surgery ended with cavity obliteration and cul-de-sac closure of the EAC (*Table 2*).

In 11 patients (39.2 % of cases) the congenital cholesteatoma was revealed. Twelve of these patients had previously undergone surgeries using different approaches in other clinics (endoscopic endaural, CWD surgeries, endoscopic transnasal approach, retrosigmoid approach). The congenital origin of cholesteatoma was diagnosed on history of the disease and first performed CT data.

Hearing loss was the most common symptom that we found in 100% of cases preoperatively, in

Table 2. Surgical management in different types of infralabyrinthine petrous bone cholesteatoma processes.

№ of Patient	Type of Process	Type of Surgical Approach	Endoscope Assistance	Neuromonitoring of FN and l.c.n.	Surgery Ending
1.	I, acquired	CWD, infralabyrinthine retrofacial approach	+	-	T-shaped meatoplasty, underlay tympanoplasty, ossicular reconstruction with autocartilage on footplate
2.	I, congenital	CWD, infralabyrinthine retrofacial approach	+	+	T-shaped meatoplasty, underlay tympanoplasty
3.	I, acquired	CWD, infralabyrinthine retrofacial approach	+	-	T-shaped meatoplasty, underlay tympanoplasty
4.	I, congenital	CWU, infralabyrinthine retrofacial approach	-	+	Reconstruction of the posterior wall of EAC with the autocartilage; underlay tympanoplasty
5.	I, acquired	CWD, combined micro-/ endoscopic infracochlear approach	+	-	MCF defect closure with osteomatrix plate, T-shaped meatoplasty, underlay tympanoplasty, ossicular reconstruction with autocartilage on stapes head
6.	I, acquired	CWD, combined micro-/ endoscopic infracochlear approach	+	-	T-shaped meatoplasty, underlay tympanoplasty
7.	I, acquired	CWD, combined micro-/ endoscopic infracochlear approach	+	-	T-shaped meatoplasty, underlay tympanoplasty, ossicular chain reconstruction with autocartilage on footplate. T
8.1	I, acquired	CWD, combined micro-/ endoscopic infracochlear approach	-	-	T-shaped meatoplasty, underlay tympanoplasty, ossicular chain reconstruction with total titanium prosthesis with hydroxyapatite head
8.2	I, acquired	CWD, combined micro-/ endoscopic transochlear approach	+	-	T-shaped meatoplasty, underlay tympanoplasty

9.	I, congenital	CWD, combined micro-/ endoscopic transochlear approach with FN decompression	+	+	Cul-de-sac
10.	I, acquired	CWD, combined micro-/ endoscopic transochlear approach	+	-	T-shaped meatoplasty, underlay tympanoplasty
11.	I-A, jatrogenic	CWD, combined micro-/ endoscopic transochlear approach	+	+	Tamponade of the apex with temporal muscle, additional placement of cartilage fragment. T-shaped meatoplasty, underlay tympanoplasty
12.1	I-A, congenital	CWD, combined micro-/ endoscopic infracochlear approach and end-to-end FN anastomosis	+	+	T-shaped meatoplasty, underlay tympanoplasty
12.2	I-A, congenital	Subtotal petrosectomy, combined micro-/endoscopic transochlear approach	+	+	Cul-de-sac
13.	I-A, congenital	Subtotal petrosectomy, combined micro-/endoscopic transochlear approach	+	+	Cul-de-sac
14.	I-A, congenital	Tansotic changed to translabyrinthine approach with preservation of FN in the bony bridge in mastoid part	+	+	Cul-de-sac
15.	I-A, congenital	Translabyrinthine approach (FN without bony canal on whole length from SMF to IAC opening)	+	+	Cul-de-sac

53.6% deafness was revealed (*Table 3*). Postoperatively we achieved satisfactory and good functional results (ABG improvement 10–20%) in those patients with residual hearing (7 patients with infralabyrinthine cholesteatoma, and 4 patients with supralabyrinthine type of cholesteatoma). The mean postoperstive PTA was 64 ± 20dB.

The frequency of different grades of FN disfunction was 32.1% in the preoperative stage (*Table 4*). In 18 patients skeletonization of FN was performed, from them—7 with following FN decompression. In 1 patient with infralabyrinthine cholesteatoma spreading to GG, and IAC fundus, there was V grade of facial muscles function by House-Brackmann, preoperatively. In 8 months a recovery to I-II grade was achieved. In 9 cases we faced transitory decrease of FN function (I -> V; IV->V; II>IV) with its partial improvement in 8 of them (FN decompression II>1; III>I; V->II; "end-to-end" FN reconstruction V>IV) in the period from 3 months to one year. It was caused by removal of cholesteatoma from the exposed areas of FN (in mastoid, tympanal, labyrin-

Table 3. Pre- and postoperative hearing status vs. class of PBCs

	S		SA		I		I-A	
	Pre	**Post**	**Pre**	**Post**	**Pre**	**Post**	**Pre**	**Post**
PTA								
I	0	0	0	0	0	0	0	0
II	1	1	0	0	4	6	0	0
III	1	2	0	0	3	1	0	0
IV	2	1	1	0	1	0	0	0
Deafness	6	6	2	3	2	3	5	5

thine) or its intracanal part (with the destruction of the capsule of the IAC) due to FN edema. In 1 case there was no positive change in facial muscle function, facial muscles reinforcement with m. temporalis was performed in another clinic. Lower cranial nerve function was preserved in all cases, even if there was total destruction of jugular foramen.

in 2 cases (1 in 2a group, 1 in 2b group—a total of 7.1%). Perioperative morbidity was equal to zero.

Based on the results of CT of the skull on days 3–10 and 1 year after the surgery in patients with MCF defect repair, we did not notice any displacement of the osteomatrix or autobone plates used to close the defects of the MCF (Fig. 3).

Table 4. Pre- and postoperative FN function vs. class of PBCs

	S		SA		I		I-A	
	Pre	**Post**	**Pre**	**Post**	**Pre**	**Post**	**Pre**	**Post**
HB grade								
I	6	9	1	2	9	9	1	2
II	1	0	0	0	0	1	1	0
III	2	0	1	1	0	0	0	0
IV	0	0	0	0	0	0	1	2
V	0	0	0	0	1	0	1	0
VI	1	1	1	1	0	0	0	0
Total	10		3		10		5	

The results of tympanoplasty were evaluated in the period from 3 to 6 months, epidermization of the trepanation cavity was determined in all 16 patients, no episodes of otorrhea were noted.

We were faced with intraoperative complications: contained cerebrospinal fluid (CSF) leak in 7 cases from the 1st group, 5 from the 2nd group with extension of cholesteatoma in IAC and destruction of its capsule (42.8% totally). Special attention was paid to the presence of signs of continued liquorrhea (accumulation of fluid in the area of the postoperative wound and the outflow of CSF into the nasopharynx) in the postoperative period.Sigmoid sinus (SS) and jugular bulb (JB) lumen opening were revealed

According to the results of MRI in DWI mode, 1 residual and four recurrences of cholesteatoma were detected (3 in 1 group; 2 in 2 group; a total of 17.8%). The patients were reoperated; revision revealed the spread of cholesteatoma along the exposed FN canal, mainly in the area of the digastric ridge of the FN, with spread to the stylomastoid foramen area in patients with supralabyrinthine cholesteatoma. In 1 case of infralabyrinthine cholesteatoma there was recurrence due to the deep location of the cholesteatoma medially to the basal turn of the cochlea. Therefore, during the second surgery, there was no chance to save the cochlea. In our practice in 1 case of infralabyrinthine apical cholesteatoma there was residual cholesteatoma (1st surgery was stopped because

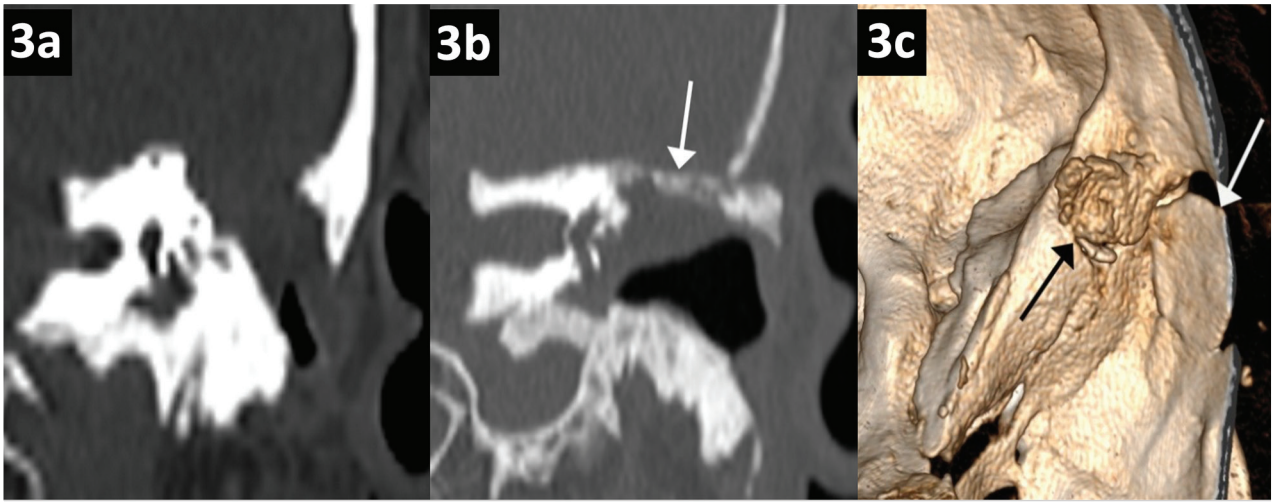


Fig. 3a. CT of MCF defect before combined CWD+MCF surgery. 3b. CT of MCF defect after repair performed by combined CWD+MCF surgery. 3c. 3D reconstruction of CT after MCF defect repair performed by combined CWD+MCF surgery

of anesthesiologic features and hemodynamic instability), after reoperation no signs of recurrence until now (the longest observation period was 36 months). In cases of limited cholesteatoma and hearing preservation (1a and 2b group) we recommended revision surgery after 1–1.5 year; in cases of a wide spreading process and decompression of FN from IAC to mastoid segment only in case of detection of cholesteatoma on DWI non-EPI images.

DISCUSSION

A number of authors believe that the possibilities of illumination and angles of view that the microscope gives have certain limitations, especially in cases of supralabyrinthine and infralabyrinthine apical spread of the pathological process; partial removal of the matrix at the first surgical intervention in the future can lead to a relapse (1-3, 11, 12, 13). The recurrence of the pyramid cholesteatoma according to various authors occurs in 17–70% of cases, with a large percentage of postoperative complications in the form of deafness and FN paresis or paralysis.

In recent years, endoscopic techniques, surgical tactics and instrumental equipment have improved significantly and have resulted in the more frequent use of endoscopic techniques in the middle ear and mastoid surgery.

In cases of supralabyrinthine cholesteatoma and preserved hearing M. Sanna recommends using approach through the middle cranial fossa. In our work, we used a combined approach (through the middle cranial fossa and transmastoidal) only for extensive defects in the front surface of the temporal bone to ensure reliable defect closure. The use of endoscopic assistants was particularly important in patients with serviceable hearing, as it provides a wide view without requiring the enlargement of the approach, which can lead to damage of the cochlea and the development of sensorineural hearing loss after surgery.

For patients with infralabyrinthine cholesteatoma with the cholesteatoma location mostly behind the mastoid segment of the FN, the hearing is usually preserved, so it is advisable to perform the CWD procedure with skeletonization of the bony wall of sigmoid sinus, FN ridge, and semicircular channels. Retrofacial infrafabyrinthine approach is recommended for cholesteatoma sanation medially to the FN (14). In cases of infralabyrinthine PBC with the involvement of the vascular part of jugular foramen (JF) and the sigmoid sinus, it is important for the surgeon to be experienced in working with venous structures. The jugular bulb (JB) as venous structure has only 2 layers in its wall, which increases the risk of bleeding during cholesteatoma detachment (no sharp dissection, only with the use of cottonoids or non-woven swabs). The surgeon should be prepared to stop profuse bleeding with Surgicell or medical wax.

In any type of PBC the only way to decrease the risk of paralysis and depreciation of the facial muscles function is to save the nerve in its bony bridge as this is done by the transotic approach. In our experience the bony canal of the FN in the mastoid segment is involved in pathological process and destroyed in the vast majority of cases of PBCs: the nerve is infiltrated by a lesion or in close proximity to the lesion over considerable length (14,15). But our conviction is that the FN should not be translocated even from the remains of the canal only to perform one of the stages of the approach because of high enough rate of cholesteatoma recurrence and frequent necessity of revision surgeries. The risk of FN injury is high during resurgery and its identification in the trepanation cavity without bony landmarks filled with autofat changed through years. Combination of microscopic and endoscopic techniques allows the elimination of the pathology all around the Fallopian cannel, medially to it, avoiding nerve rerouting and performing sanation of hidden areas.

In the case of absence of a CSF leak, cavity obliteration and EAC blind sac closure was not performed due to the possibility of monitoring the trepanation cavity in the postoperative period and preventing iatrogenic damage to FN during the resurgery in cases of resisting cholesteatoma. For the same purpose, the FN trunk was separated from the surrounding structures with fascial flap and autocartilage plates to reduce its compression in the early postoperative period and to elevate the level of neotympanic membrane above the FN. This technique has allowed us to achieve a relatively low percentage of development of facial muscle paresis in the postoperative period.

CONCLUSION

1. Surgical planning based on precision study of preoperative CT data, taking into account the peculiarity of localization and extension of the process, presence of MCF defects allows to successfully eliminate the pathological process with the possibility of minimizing injuries of vital structures and to get reliable closure of bone defects between the postoperative cavity and MCF.
2. Preservation of the hearing function in patients with supralabyrinthine and infralabyrinthine cholesteatoma is possible in less than in half percent of cases.

3. In most cases of supralabyrinthine and supralabyrinthine-apical forms of cholesteatomas there are tegmental defects of the temporal bone. The use of a combined approach (transmastoid and middle cranial fossa) in cases of large (more than 10 mm) ones contributes to their reliable closure in all patients.
4. The use of combined of microscopic technique with endoscopic assistance provides good visualization with less traumatic access to the lesion zone, reducing the percentage of recurrences in the postoperative period.

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