

Managing Recurrent Pediatric Cholesteatoma: Canal Wall Down Mastoidectomy with Bone Pate Obliteration

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Summary

Introduction. Cholesteatoma is characterized by the proliferation of keratinized squamous epithelium in the middle ear or mastoid process. Its annual incidence is 6–9 cases per 100,000 individuals, with higher prevalence in children. Surgical treatment is crucial for disease eradication, ensuring a safe and dry middle ear. Two surgical approaches are available: canal wall up and canal wall down. The canal wall down technique provides superior visualization and is preferred in cases of extensive disease or high recurrence risk, especially when combined with mastoid obliteration using autologous materials, like bone pate, for improved long-term outcomes.

Clinical Case. An 11-year-old male with recurrent left-sided purulent otorrhea and progressive hearing loss underwent multiple ear surgeries for chronic atticotympanic suppurative otitis media. Despite surgical management, cholesteatoma persisted, necessitating a revision antrotomy with mastoid obliteration. Intraoperatively, the mastoid cavity was filled with cholesteatoma extending

into the attic, sinus tympani, and aditus ad antrum, with severe ossicular erosion. Cholesteatoma and granulation tissue were excised, and tympanic membrane repair was completed using tragal cartilage and perichondrium. The mastoid cavity was obliterated with bone pate harvested from the mastoid cortex, secured with hemostatic materials and covered with free skin grafts.

Discussion. The canal wall down technique is effective in cholesteatoma management, offering enhanced visualization of middle ear structures, enabling complete cholesteatoma removal, and reducing recurrence rates. However, it presents challenges related to cavity maintenance, including persistent otorrhea. Mastoid obliteration reduces cavity size, lowers infection risk, and promotes a dry and self-cleaning ear. Various autologous, allogenic and heterologous materials can be used for obliteration. Autologous materials, such as bone pate, are biocompatible, provide long-term structural stability, and ensure effective cavity closure, thereby reducing the risk of recurrence and the need for revision surgery.

Conclusions. Cholesteatoma is a highly recurrent and destructive disease, often requiring multiple surgical interventions. Canal wall down mastoidectomy is the preferred approach in recurrent cholesteatoma, as it allows for thorough disease clearance and reduced recurrence risk. Mastoid obliteration, particularly with autologous bone pate, significantly improves long-term outcomes by reducing cavity size and minimizing infection risk.

Keywords: mastoidectomy; canal wall down; mastoid obliteration; bone pate; cholesteatoma; chronic otitis media.

INTRODUCTION

Cholesteatoma is a benign cystic lesion characterized by the proliferation of keratinized squamous epithelium within the middle ear or the mastoid process [1]. Its annual incidence is estimated at 6–9 cases per 100,000 individuals, with a higher prevalence among pediatric populations [2]. Cholesteatoma can be classified as either congenital or acquired, the latter constituting the majority of cases [3]. Acquired cholesteatoma typically develops either as a primary lesion from chronic tympanic membrane retraction or as a secondary lesion following tympanic membrane perforation, trauma, or iatrogenic injury [4].

Cholesteatoma is composed of the perimatrix, matrix, and keratin. The perimatrix, a biologically active component, is responsible for producing proteolytic enzymes that, in conjunction with inflammatory mediators, contribute to the destruction of surrounding bone tissue [5]. This process facilitates cholesteatoma growth, spread, and increases the risk of recurrence.

Cholesteatoma commonly presents with persistent, foul-smelling purulent otorrhea, recurrent ear infections, otorrhagia, tinnitus, otalgia and conductive hearing loss due to partial or complete erosion of the auditory ossicles [5]. Diagnosis is established through otoscopic examination, audiometry, and advanced imaging modalities

including computed tomography (CT) for assessing the extent of bone erosion and magnetic resonance imaging (MRI) with diffusion-weighted sequence for detecting residual disease [1, 5, 6].

Surgical management is the definitive treatment, with the primary objectives being complete eradication of the disease, creation of a safe, dry middle ear, and restoration of auditory function [1]. Two main surgical approaches can be employed: canal wall up (CWU) and canal wall down (CWD) techniques [4]. The CWU technique aims to preserve posterior wall of the external auditory canal, while the CWD technique involves its removal, providing superior visualization of critical anatomical structures [5, 7].

In cases with extensive disease or high risk of recurrence, CWD mastoidectomy combined with mastoid obliteration using autologous materials, such as bone pate, has emerged as an effective method to minimize postoperative cavity-related complications and improve long-term outcomes [8].

CLINICAL CASE

An 11-year-old male presented to our outpatient clinic with a longstanding history of recurrent left-sided purulent otorrhea mixed with blood, accompanied by progressive hearing loss. The patient had undergone multiple surgical interventions for chronic atticoantral suppurative otitis media in the past, yet the disease remained refractory, with repeated recurrences despite surgical management.

The initial manifestation occurred at the age of two, presenting with left-sided purulent otorrhea, otalgia, postauricular swelling, erythema, and tenderness. The patient's blood analysis demonstrated leukocytosis, neutrophilia, and thrombocytosis accompanied by a reduction in hemoglobin levels, suggestive of an ongoing inflammatory or infectious process. Suspecting complicated suppurative otitis media, the patient underwent a reconstructive mastoidectomy, which revealed a subperiosteal abscess (3–5 mL of pus) and extensive mastoid cell destruction due to cholesteatoma and granulation tissue. A microbiological culture was performed on the purulent material obtained intraoperatively, revealing the growth of *Staphylococcus aureus*. Histopathological examination confirmed the diagnosis of acute mastoiditis, subperiosteal abscess, and chronic atticoantral suppurative otitis media. The cholesteatoma and granulation tissue were meticulously excised, and the mastoid cavity was irrigated with a ceftriaxone solution.

One year later, the patient developed recurrent suppurative otorrhea. Otoscopic examination revealed a pars flaccida perforation of the tympanic membrane. A CT scan of the temporal bone demonstrated a heterogeneous dense mass occupying the tympanic cavity and antrum, with mastoid cell destruction, consistent with cholesteatoma (Fig. 1, 2, 3). A reconstructive antromastoidectomy was performed, and cholesteatoma with granulation tissue were removed. Histopathological examination of the excised material confirmed fragments of keratinized squamous epithelium, supporting the diagnosis of cholesteatoma.

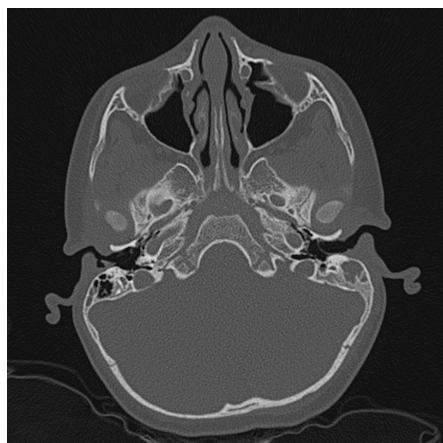


Fig. 1. An axial computed tomography scan shows no evidence of cholesteatoma in the external auditory canal and an intact tympanic membrane in the left ear.

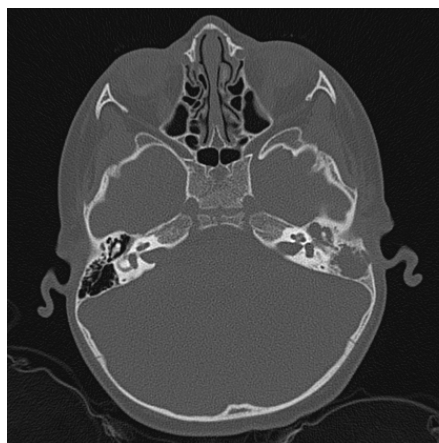


Fig. 2. An axial computed tomography scan reveals ossicular erosion and cholesteatoma extending into the antrum of the left ear.



Fig. 3. An axial computed tomography scan shows extensive mastoid cell destruction and cholesteatoma in the antrum of the left ear.

Over the following years, the disease exhibited periods of remission and recurrence with gradual progression. The patient continued to be monitored in our department and received outpatient management for disease exacerbations, which included regular ear cleaning and local and systemic antibacterial therapy. The patient had undergone additional reconstructive mastoidectomy, radical mastoidectomy with mastoid

obliteration using auricular cartilage (Fig. 4) and temporal muscle fascia (Fig. 5), and revision surgery with meatoplasty for cholesteatoma extending into the external ear canal. Despite multiple interventions, disease recurred four years after the last surgical procedure. Given the persistence of cholesteatoma and further disease progression, a revision antromastoidectomy with mastoid obliteration using bone pate was advised.

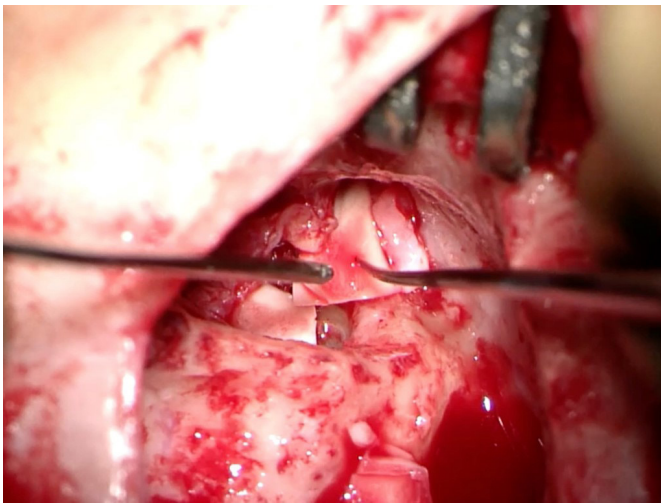


Fig. 4. Mastoid obliteration using auricular cartilage and temporal muscle fascia.

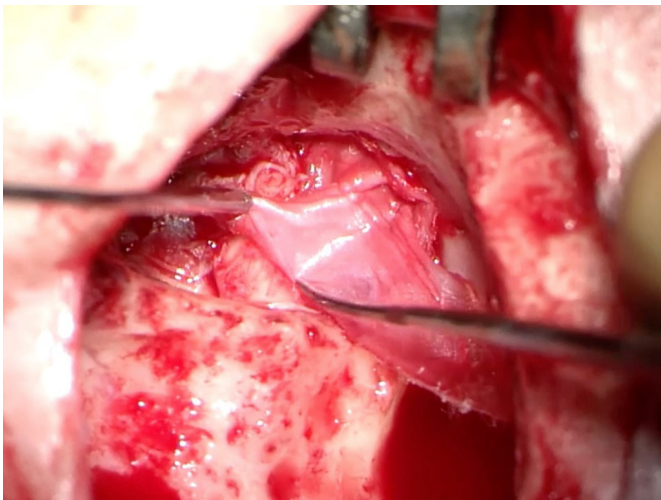


Fig. 5. Mastoid obliteration using auricular cartilage and temporal muscle fascia.

Preoperative endoscopic examination of the left ear revealed yellowish secretion in the external auditory canal and tympanic membrane retraction, whereas the tympanic membrane of the right ear was intact. The Rinne test was negative in the left ear and positive in the right, indicating a conductive hearing loss on the affected side.

On the day of the surgery, the patient was placed under general endotracheal anesthesia and postauricular approach, exposing the mastoid bone, was adopted. Under the microscopic guidance, the antrum was accessed with a diamond burr, revealing a poorly pneumatized mastoid cavity densely filled with cholesteatoma, extending into the attic, sinus tympani, and aditus ad antrum (Fig. 6). The auditory ossicles were severely eroded, and the stapes was immobile due to fibrotic adhesions from prior surgeries. The posterior bony wall of the external auditory canal, which had been previously removed, was visualized. Cholesteatoma and granulation tissue were meticulously excised. Tympanic membrane reconstruction was performed using tragal cartilage and perichondrium (Fig. 7), which were covered with a silicone sheet. The mastoid cavity was obliterated with bone pate harvested from the mastoid bone cortex (Fig. 8),

secured with Spongostan and a Merozel swab soaked in ciprofloxacin solution and covered with free skin grafts. The external auditory canal was packed with hemostatic sponges, and the incision was carefully sutured.

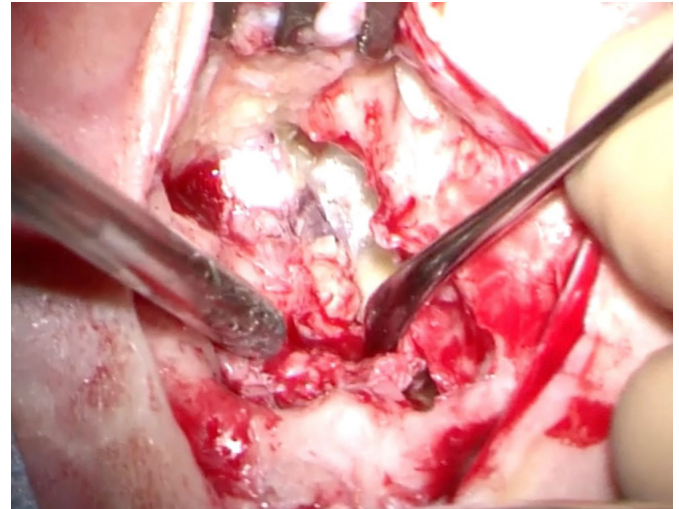


Fig. 6. Cholesteatoma in the mastoid cavity.

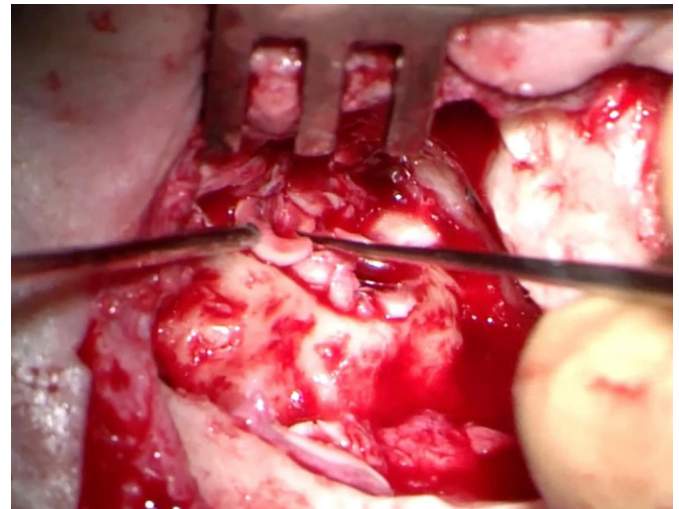


Fig. 7. Tympanic membrane reconstruction using cartilage and perichondrium harvested from the tragal region.

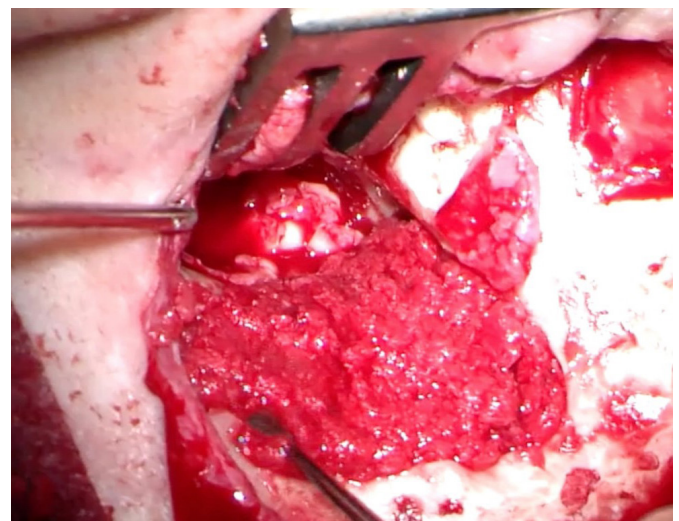


Fig. 8. Mastoid obliteration using bone pate harvested from the mastoid bone cortex.

Postoperatively, the patient exhibited significant clinical improvement and was discharged on the fifth postoperative day. The reconstructed tympanic membrane separated the tympanic cavity from the external auditory canal, while bone pate obliteration reduced the postoperative cavity size. The free skin flap healed successfully, creating a stable and well epithelialized postoperative cavity. Suppuration resolved, and follow-up examinations confirmed a stable surgical outcome with no evidence of recurrent cholesteatoma.

DISCUSSION

Surgical intervention is the only definitive treatment for complete cholesteatoma eradication, whereas conservative management is limited to cases where surgery is contraindicated [4]. The primary objectives of surgery are to establish a safe, dry middle ear and to preserve or restore auditory function [1]. CWU and CWD are the main surgical approaches [4]. Our patient had undergone multiple interventions, including both CWU and CWD procedures for chronic atticotympanic suppurative otitis media, yet the disease remained refractory with recurrent episodes. Significant clinical improvement and a stable surgical outcome, with no evidence of recurrent cholesteatoma, were achieved through a CWD approach combined with mastoid obliteration using bone pate.

The selection of the surgical technique is determined by factors such as the size, location, and extent of cholesteatoma, as well as the anatomical characteristics of the temporal bone. CWD surgery is considered the gold standard, as it provides extensive exposure of critical anatomical structures in the middle ear and mastoid process [1]. Indications for CWD surgery include bony erosion of the posterior external auditory canal wall exceeding 50%, the presence of a labyrinthine fistula, a large defect in the roof of the tympanic cavity, and a sclerotic mastoid process. CWD surgery is recommended for patients with cholesteatoma in their only hearing ear [9]. At the initial presentation, our patient exhibited left-sided purulent otorrhea, otalgia, postauricular swelling, erythema, and tenderness, without signs of vertigo, nausea, vomiting, or other symptoms suggestive of a labyrinthine fistula. Otoscopic examination did not reveal cholesteatoma extending into the external auditory canal. Given the lack of strong suspicion for cholesteatoma and the uncertain extent of the disease, a less radical approach of mastoidectomy was initially chosen, using the CWU technique. However, intraoperative findings revealed extensive mastoid cell destruction caused by cholesteatoma and granulation tissue, underscoring the severity of the disease.

CT is instrumental in determining the extent of cholesteatoma within the middle ear and mastoid process, as well as identifying bone erosions associated with the disease [1]. Preoperative imaging is crucial for detecting anatomical variations that may complicate surgery, such as middle ear hypoplasia, a displaced position of the jugular vein, dehiscence of the facial nerve canal, sclerotic mastoid air cells, an anteriorly positioned sigmoid sinus, or the presence of a labyrinthine fistula [5]. Early recognition of these variations reduces the risk of intraoperative and postoperative complications. In our patient, a preoperative temporal CT scan was

not performed before the initial management of the disease. However, after a recurrence one year later, CT imaging revealed a heterogeneous dense mass occupying the tympanic cavity and antrum, with mastoid cell destruction, findings consistent with cholesteatoma.

CWU mastoidectomy may be performed in cases without significant erosion of the external auditory canal or labyrinth [9]. This technique aims to restore the sound transmission system of the middle ear and is particularly suitable for younger patients with minimal preoperative hearing loss, as it yields superior postoperative hearing outcomes. In CWU surgery, the preservation of the anatomical integrity of the external auditory canal facilitates the fitting of hearing aids, thereby enhancing long-term auditory rehabilitation [10]. Given that our patient was only two years old at the initial manifestation of the disease, the primary surgical goal was to preserve the ear's anatomical structure to the greatest extent possible.

The primary objective of CWU surgery is to achieve cholesteatoma eradication while preserving the outer wall of the auditory canal [5]. This technique involves the excision of damaged portions of the auditory ossicles and tympanic membrane, followed by reconstruction using cartilage, fascia, or alloplastic ossiculoplasty prostheses [9]. By restoring the anatomical integrity of the middle ear, CWU surgery aims to reestablish a functional sound transmission system. Limited visualization of key anatomical structures, such as the recessus facialis and sinus tympani, increases the difficulty of detecting and excising disease affected areas, thereby contributing to a higher risk of cholesteatoma recurrence [4]. While successful reconstruction of well-functioning middle ear structures is achieved in 65%–90% of cases, cholesteatoma recurrence rates remain significant, occurring in up to 40%–60% of pediatric cases [7, 9]. The recurrent nature of the disease following the CWU approach was evident in our patient, who required multiple revision surgeries for cholesteatoma removal in the years following the initial management.

Key risk factors for recurrence include erosion of the auditory ossicles, extension into the sinus tympani, large cholesteatoma size, and inadequate surgical experience [11]. In the latest CWD mastoidectomy severe erosion of the auditory ossicles was observed in our patient, with the stapes being immobile due to fibrotic adhesions from previous surgeries. The mastoid cavity was densely filled with cholesteatoma, extending into the attic, sinus tympani, and aditus ad antrum.

Despite multiple unsuccessful CWU mastoidectomies leading to disease recurrence, a radical CWD mastoidectomy with mastoid obliteration using auricular cartilage and temporal muscle fascia was performed.

The CWD technique entails the removal of the posterior wall of the external auditory canal, resulting in a single open cavity encompassing the external auditory canal, tympanic cavity, and mastoid process [12]. This approach provides superior visualization of middle ear structures, enabling complete cholesteatoma removal and reducing recurrence rates to 2%–17% [7]. However, postoperative complications are common, with patients frequently experiencing challenges related to cavity maintenance, including the need for regular cleaning, suctioning of debris, and water restrictions [13].

Persistent otorrhea occurs in 10%–35% of cases, and hearing restoration outcomes are generally inferior compared to the CWU technique [9, 14]. Factors contributing to the failure of CWD surgery include residual infected mastoid air cells, large mastoid cavities, high facial ridge, bony overhang in the mastoid cavity, tympanic membrane perforations, and a narrow meatus. In our patient, the initial CWD mastoidectomy led to recurrent cholesteatoma extending into the external auditory canal, necessitating a revision surgery with meatoplasty. While discharging mastoid cavities can often be managed successfully through frequent maintenance cleaning and topical treatment, some cases may necessitate revision surgery to achieve a stable result [15].

Following revision surgery with meatoplasty, our patient was closely monitored in our outpatient clinic, with disease exacerbations managed through regular ear cleaning and topical and systemic antibacterial therapy. However, after four years of persistent purulent discharge and progressive hearing loss, a revision antromastoidectomy with mastoid obliteration using bone pate was recommended. This procedure enabled extensive cholesteatoma clearance from critical areas, including the attic, sinus tympani, and aditus ad antrum. The intervention resulted in resolved suppuration and a stable surgical outcome, with no evidence of recurrent cholesteatoma.

Mastoid obliteration is an effective technique for achieving long-term stability of the mastoid cavity and preventing cavity-related complications [8]. This technique facilitates postoperative healing and epithelialization and can be performed as a primary procedure at the time of CWD surgery or as a secondary intervention following a previous CWD surgery [16]. In our patient, mastoid obliteration using bone pate was performed as a secondary procedure, as the posterior wall of the external auditory canal had been removed during the initial CWD mastoidectomy, which was originally obliterated with auricular cartilage and temporal muscle fascia.

Reduction of cavity size results in a dry, self-cleaning ear with a lower risk of infection, reducing the need for frequent cavity cleaning [17]. Postoperative dry ear rates are higher in obliterated cavities compared to non-obliterated ones [15]. Restoration of external auditory canal anatomy allows unrestricted water exposure, improves hearing aid compatibility, and decreases caloric-induced vertigo [16, 18]. Hearing outcomes are generally superior in obliterated mastoid cavities, with the air-bone gap remaining similar or reduced compared to open cavities [17].

A major concern in mastoid obliteration is the potential entrapment of cholesteatoma or keratin debris, which may result in recurrent or residual disease and, in severe cases, intracranial complications [10]. Despite this risk, recurrence and residual disease rates remain lower in obliterated cases, approximately 4.6% and 5.4%, respectively, compared to non-obliterated CWD or CWU procedures [19]. Complete removal of cholesteatoma and squamous epithelial lining is critical before proceeding with obliteration to mitigate the risk of disease persistence [20].

Materials used for mastoid obliteration are classified into three main categories: autologous, allogenic, and heterologous

[21]. In this case, both mastoid obliterations were performed using autologous materials. The initial CWD mastoidectomy was obliterated with auricular cartilage and temporal muscle fascia, while the second procedure utilized bone pate harvested from the patient's mastoid cortex.

Autologous materials, including bone pate, bone chips, fat, cartilage, and soft tissue flaps, are commonly used in mastoid obliteration due to their biocompatibility and low risk of adverse reactions as they are harvested directly from the patient [22]. Bone is the preferred choice, offering long-term volume stability and effective cavity closure [21]. The selection of autologous bone pate in our patient highlights the emphasis on biocompatibility and long-term durability. Bone pate in combination with platelet-enriched plasma has been shown to enhance wound healing and tissue sealing at low cost [23]. Cartilage chips, typically harvested from the concha or tragus, promote fibrous tissue growth, increasing obliteration volume over time [21]. Soft tissue flaps, such as fascia, periosteum, and muscle, provide additional reconstructive options [10]. Commonly used flaps include the middle temporal artery flap, temporoparietal fascia flap, and specialized options such as the Palva flap (an anteriorly based musculoperiosteal flap) and the Hong Kong flap (a vascularized temporalis fascia flap) [16]. Despite their significant benefits, autologous materials have certain limitations, including limited availability, donor site morbidity, resorption, atrophy, and the potential need for revision surgery [24]. In our patient, auricular cartilage and temporal muscle fascia used in the initial CWD mastoidectomy with obliteration may have undergone atrophy and resorption over time. Combined with the formation of a narrow meatus following CWD, these factors likely contributed to disease recurrence, ultimately necessitating revision surgery.

Allogenic materials, derived from cadaveric bony tissues, undergo processing to eliminate infectious agents and ensure biocompatibility [25]. Bone allografts include fresh or frozen bone, freeze-dried bone, and demineralized freeze-dried bone [21]. These materials are readily available in large quantities and eliminate the risk of donor site morbidity associated with autologous grafts [24].

Heterologous materials are also widely used for mastoid obliteration, with bioactive glass being the most common [21]. The primary types studied in vivo are S53P4 and 45S5, both of which exhibit osteoconductivity and support osteogenesis [26]. S53P4 demonstrates antimicrobial activity against bacteria, including methicillin-resistant *Staphylococcus aureus* [27]. Hydroxyapatite, composed of calcium and phosphorus, offers superior osteoconductivity compared to other nonautologous materials. While hydroxyapatite is stable in long-term implantation, it carries an increased risk of infection and material extrusion [24]. Silicone is inexpensive, but it may provoke foreign body reactions in predisposed individuals [28]. Heterologous materials are advantageous due to their unlimited availability, ease of use, sterility, and potential to achieve favorable aesthetic and functional outcomes. However, a major drawback is the risk of inflammatory responses stemming from foreign body reactions [22].

Diffusion-weighted magnetic resonance imaging (DW-MRI) is increasingly used for the evaluation of residual cholesteatoma and postoperative surveillance to assess the risk of recurrence [6]. This non-invasive imaging modality offers a reliable alternative to repeated surgical exploration, thereby reducing the need for revision procedures in patients at high risk of disease recurrence [4]. Given its effectiveness, DW-MRI is a viable option for ongoing postoperative surveillance in our patient.

CONCLUSIONS

Cholesteatoma is a highly recurrent and destructive disease, often requiring multiple surgical interventions. Due to its aggressive nature and high recurrence rates, achieving complete disease eradication is particularly challenging in pediatric cases.

Canal wall down mastoidectomy is the preferred approach in recurrent cholesteatoma, as it provides superior visualization of critical middle ear structures, allowing for thorough disease clearance and reduced recurrence risk. However, conventional canal wall down technique is associated with postoperative cavity-related complications, including persistent otorrhea and the need for lifelong maintenance.

Mastoid obliteration has emerged as an essential adjunct to canal wall down mastoidectomy, significantly improving long-term outcomes by reducing cavity size, enhancing epithelialization, and minimizing infection risk. Among the various obliteration materials, autologous bone pate stand out as the optimal choice due to their excellent biocompatibility, structural stability, and long-term volume preservation. Their use in our patient effectively prevented further recurrence and facilitated a stable and a dry ear.

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Santrauka

RECIDYVINĖS VAIKŲ CHOLESTEATOMOS GYDYMAS ATLIEKANT RADIKALIĄ MASTOIDEKTOMIJĄ SU KAULINIŲ DROŽLIŲ OBLITERACIJA: KLINIKINIS ATVEJIS

Matas Kuncė, Eugenijus Lesinskas

Įvadas. Cholesteatoma – tai daugiaskluksnio plokščiojo ragėjančio epitelio proliferacija vidurinėje ausyje ar speninėje ataugoje. Liga kasmet nustatoma 6–9 iš 100 000 asmenų, dažniau vaikams. Pagrindinis gydymo metodas yra mastoidektomija – chirurginė procedūra, leidžianti visiškai pašalinti cholesteatomą bei suformuoti saugią ir sausą vidurinę ausį.

Naudojamos dvi pagrindinės chirurginės technikos: radikali tausojanti ir rekonstrukcinė. Radikali mastoidektomija suteikia gerą anatominių struktūrų vizualizaciją ir dažniausiai atliekama esant pažengusiai ar recidyvinei ligos stadijai. Speninės ataugos obliteracija tokiomis autologinėmis medžiagomis, kaip kaulinės drožlės, užtikrina gerus ilgalaikius gydymo rezultatus.

Klinikinio atvejo aprašymas. Vienuolikos metų berniukui, sergančiam lėtiniu atikoantraliniu pūlingu viduriniu otitu, buvo atliktos kelios kairės ausies operacijos dėl pasikartojančios pūlingos otorėjos ir klausos sutrikimo. Nepaisant chirurginio gydymo, cholesteatoma atsinaujino, todėl buvo rekomenduota pakartotinė antromastoidektomija su speninės ataugos obliteracija. Operacijos metu nustatytas cholesteatomos plitimas į viršbūgninę ertmę, būgninį antį, speninės ataugos urvą ir pastebėta klausomųjų kauliukų erozija. Cholesteatominiai ir granuliaciniai audiniai buvo pašalinti, o būgnelis rekonstruotas kremzle su antkremzliu iš kramslio srities. Speninė atauga pripildyta kaulinių drožlių, sutvirtinta hemostatinėmis medžiagomis ir dengta laisvais odos lopais.

Diskusija. Radikali mastoidektomija yra veiksmingas cholesteatomos gydymo būdas, užtikrinantis geresnę vidurinės ausies anatominių struktūrų vizualizaciją ir radikalią cholesteatomos pašalinimą, o tai sumažina ligos recidyvo riziką. Tačiau po šios operacijos neretai išlieka otorėja, dėl to reikia nuolatinės pooperacinės ertmės priežiūros ir valymo. Speninės ataugos obliteracija padeda sumažinti pooperacinės ertmės dydį, infekcijos riziką ir otorėją. Autologinės medžiagos, tokios kaip kaulinės drožlės, pasižymi dideliu biologiniu suderinamumu, užtikrina ilgalaikį struktūrinį stabilumą ir sumažina ligos recidyvo riziką bei pakartotinės operacijos poreikį.

Išvados. Cholesteatoma yra destruktinė ir recidyvinė liga, kurią dažnai reikia gydyti atliekant pakartotines chirurgines intervencijas. Radikali mastoidektomija yra veiksmingiausias metodas recidyvinei cholesteatomai gydyti, nes leidžia visiškai išgydyti ligą ir sumažinti jos atsinaujinimo riziką. Speninės ataugos obliteracija kaulinėmis drožlėmis užtikrina gerus ilgalaikius pooperacinius rezultatus, nes sumažina pooperacinės ertmės dydį ir infekcijos riziką.

Reikšminiai žodžiai: radikali mastoidektomija, speninės ataugos obliteracija, kaulinės drožlės, cholesteatoma, lėtinis vidurinis otitas.

REFERENCES

1. Fallon K, Chi D, Remenschneider A. Management of Cholesteatoma: Surgical Options for Disease Limited to Middle Ear/Mastoid. Otolaryngologic Clinics of North America. W.B. Saunders; 2024.
2. Bonnard Å, Berglin CE, Wincent J, Eriksson PO, Westman E, Feychting M, et al. The Risk of Cholesteatoma in Individuals With First-degree Relatives Surgically

Treated for the Disease. *JAMA Otolaryngol Head Neck Surg* 2023 May 11; 149(5).

3. Reuven Y, Raveh E, Ulanovski D, Hilly O, Kornreich L, Sokolov M. Congenital cholesteatoma: Clinical features and surgical outcomes. *Int J Pediatr Otorhinolaryngol* 2022 May 1; 156.

4. Bovi C, Luchena A, Bivona R, Borsetto D, Creber N, Danesi G. Recurrence in cholesteatoma surgery: what have we learnt and where are we going? A narrative review. *Acta Otorhinolaryngol Ital* 2023; 43: S48–55.

5. Pachpande TG, Singh CV. Diagnosis and Treatment Modalities of Cholesteatomas: A Review. *Cureus* 2022; 14(11): e31153. DOI 10.7759/cureus.31153

6. Esmaili AA, Hasan Z, Withers SJ, Kuthubutheen J. A retrospective cohort study on false positive diffusion weighted MRI in the detection of cholesteatoma. *Austr J Otolaryngol* 2021 Jun 1; 4.

7. Mendlovic ML, Monroy Llaguno DA, Schobert Capetillo IH, Cisneros Lesser JC. Mastoid obliteration and reconstruction techniques: A review of the literature. *PLA General Hospital Department of Otolaryngology Head and Neck Surgery*. *J Otol* 2021; 16: 178–84.

8. Meena S, Kumar R, Meena RK. Comparative Analysis of Various Materials Used for Mastoid Cavity Obliteration in Canal Wall Down Mastoid Surgery. *Ind J Otolaryngol Head Neck Surg* 2024 Apr 1; 76(2): 1586–94.

9. Tan D, Schauwecker N, Perkins EL, Lee K. Outcomes with Management of Cholesteatoma. *Otolaryngologic Clinics of North America*. W.B. Saunders; 2024.

10. Caro J, Leung JF, Ramos PH. Canal Wall Down v/s Canal Wall Up. In: Goycoolea MV, Selaimen Da Costa S, De Souza C, Paparella MM, eds. *Textbook of Otitis Media*. Springer Cham, 2023. Available from: https://doi.org/10.1007/978-3-031-40949-3_55

11. Volgger V, Lindeskog G, Krause E, Schrötzlmair F. Identification of risk factors for residual cholesteatoma in children and adults: a retrospective study on 110 cases of revision surgery. *Braz J Otorhinolaryngol* 2020 Mar 1; 86(2): 201–8.

12. Yusof ANM, Boon WJ, Ali A, Tang IP. Outcomes of canal wall down mastoidectomy in cholesteatoma: a 5-year experience. *Egypt J Otolaryngol* 2023 Dec 1; 39(1).

13. Wilkie MD, Chudek D, Webb CJ, Panarese A, Banhegyi G. Canal wall down mastoidectomy with obliteration versus canal wall up mastoidectomy in primary cholesteatoma surgery. *J Laryngol Otol* 2019; 133(12): 1074–8.

14. Samadhiya M, Agarwal H, Vaidya S, Sharma JK. Outcome of Canal Wall Down Mastoidectomy: A Retrospective Review. *Ind J Otolaryngol Head Neck Surg* 2022 Aug 1; 74: 21–5.

15. van der Toom HFE, van der Schroeff MP, Molenaar TL, Metselaar M, van Linge A, Vroegop JL, et al. Revision surgery for chronically discharging mastoid cavities: mastoid obliteration with canal wall reconstruction versus non-obliteration surgery. *Eur Arch Oto-Rhino-Laryngol* 2022 Aug 1; 279(8): 3881–9.

16. Nikam S, Vedi J, Chandankhede V, Ekhar V, Shelkar R. Comparative Study of Various Techniques of Mastoid

Obliteration following Canal Wall Down Mastoidectomy. *Ind J Otolaryngol Head Neck Surg* 2023 Dec 1; 75(4): 3457–60.

17. Bhardwaj H, Amin S, Bhardwaj Y, Mahmood T, Raj D. Comparison of Outcomes of Open Mastoid Cavity- with or Without Obliteration. *Ind J Otolaryngol Head Neck Surg* 2022 Dec 1; 74: 4341–4.

18. Al Tamami N, Bawazeer N, Fieux M, Zaouche S, Tringali S. Tolerance and safety of 45S5 bioactive glass used in obliteration procedures during middle ear surgery: Preliminary results. *Am J Otolaryngol - Head Neck Med Surg* 2020 Nov 1; 41(6).

19. van der Toom HFE, van der Schroeff MP, Metselaar M, van Linge A, Vroegop JL, Pauw RJ. A retrospective analysis of hearing after cholesteatoma surgery: the bony obliteration tympanoplasty versus canal wall up and canal wall down without mastoid obliteration. *Eur Arch Oto-Rhino-Laryngol* 2022 Nov 1; 279(11): 5181–9.

20. Shree NR, Ravikumar A, Sarvanam PK. Mastoid Obliteration: A Comparison of Two Techniques. *Ind J Otolaryngol Head Neck Surg* 2022 Aug 1; 74: 692–8.

21. Choong KWK, Kwok MMK, Shen Y, Gerard JM, Teh BM. Materials used for mastoid obliteration and its complications: a systematic review. *John Wiley and Sons Inc. ANZ J Surg* 2022; 92: 994–1006.

22. Viberti F, Monciatti G, Donniacuo A, Ferretti F, Sallerni L, De Vito A, et al. Heterologous Materials Are Really Better than Autologous in Tympanoplasty Mastoid Obliteration? A Systematic Review with Meta-Analysis. *J Int Adv Otol* [Internet] 2024; 20(5): 439–49. Available from: www.advancedotology.org

23. Askar SM, Saber IM, Omar M. Mastoid Reconstruction With Platelet-Rich Plasma and Bone Pate After Canal Wall Down Mastoidectomy: A Preliminary Report. *Ear Nose Throat J* 2021 Aug 1; 100(7): 485–9.

24. Fata A, Montagner G, Trojan D, Di Pasquale Fiasca VM. Mastoid Obliteration With Freeze-Dried Bone Allograft in Canal Wall Down Tympanoplasty: Description of a Novel Technique and Case Report. *Awad SS, editor. Case Rep Surg* [Internet]. 2024 Jan 30; 2024(1). Available from: <https://onlinelibrary.wiley.com/doi/10.1155/2024/4874411>

25. Kim WJ, Park C, Sim S, Hong TU, Park SY, Heo KW. Safety and Effectiveness of Bone Allografts for Mastoid Obliteration After Mastoidectomy: A Pilot Study. *J Audiol Otol* 2024; 28(3): 221–7.

26. Chand P, Malik M, Prasad T. Bioactive Glass for Applications in Implants: A Review. *John Wiley and Sons Inc. ChemistrySelect* 2024; 9.

27. Müller N, Kollert M, Trampuz A, Gonzalez Moreno M. Efficacy of different bioactive glass S53P4 formulations in bio-film eradication and the impact of pH and osmotic pressure. *Colloids Surf B Biointerfaces*. 2024 Jul 1; 239.

28. Sorour SS, Mohamed NN, Abdel Fattah MM, Elbary MESA, El-Anwar MW. Bioglass reconstruction of posterior meatal wall after canal wall down mastoidectomy. *Am J Otolaryngol - Head Neck Med Surg* 2018 May 1; 39(3): 282–5.