

Review of 6 Years of Middle Ear Surgery in the ENT-Laryngology Department of the Donka National Hospital and a Literature Review

Mamadou Aliou Diallo¹, Ibrahima Diallo¹, Mamadou Mouctar Ramata Diallo², Sayon Kourouma¹, Alsény Camara¹, Alsény Cissé³, Abdoulaye Bayo¹, Barry Alpha Oumar¹, Sory Sacko¹, Abdoulaye Keita¹

¹Service d'ORL Hôpital National Donka, Conakry, Guinea

²Service d'ORL Hôpital Régional de Mamou, Mamou, Guinea

³Service d'ORL Hôpital Régional de Labé, Labé, Guinea

Email: draliou23@gmail.com

How to cite this paper: Diallo, M.A., Diallo, I., Diallo, M.M.R., Kourouma, S., Camara, A., Cissé, A., Bayo, A., Oumar, B.A., Sacko, S. and Keita, A. (2024) Review of 6 Years of Middle Ear Surgery in the ENT-Laryngology Department of the Donka National Hospital and a Literature Review. *Surgical Science*, 15, 471-479.

<https://doi.org/10.4236/ss.2024.158044>

Received: June 27, 2024

Accepted: August 11, 2024

Published: August 14, 2024

Copyright © 2024 by author(s) and Scientific Research Publishing Inc.

This work is licensed under the Creative Commons Attribution-NonCommercial International License (CC BY-NC 4.0).

<http://creativecommons.org/licenses/by-nc/4.0/>



Open Access

Abstract

Introduction: Middle ear surgery is increasingly performed in our department. Our goal was to take stock of this activity in the ENT department of the Donka National Hospital. **Equipment and Methods:** It was a descriptive and retrospective study; it involved 71 patients' records operated from January 1, 2018 to December 31, 2023. We included the files of patients who had a middle ear surgery including the post-operative report and follow-up. Incomplete or illegible records were excluded. The parameters studied were epidemiological, otoscopic, tomodesitometric, surgical indications, surgical techniques and results. **Results:** We recorded 71 middle ear surgeries out of 548 ENT surgeries, the prevalence was 12.96%. The average age was 23 years (type-deviation = 17, 29 years) with extremes of 3 to 75 years. According to the preoperative audiometry, the deafness was medium (48.8%), mild (36.9%) and severe (14.3%). The operative indications were among others: perforation of the tympanic sequellar (52.5%), chronic otomastoiditis (23.8%), cholesteatoma (15%) and seromucous otitis (8.7%). We performed 70 tympanoplasties (90.9%), 50 mastoidectomies (64.9%) and 7 trans-tympanic aerators (9.1%). One month after surgery, the neotympanum was constituted in 86%, and the hearing gain was between 11 and 15 dB in 18.3% of cases. **Conclusion:** Middle ear surgery was infrequent. Young subjects are the most concerned. Tympanoplasty and mastoidectomy are the main surgical techniques. The anatomical and functional results are appreciable.

Keywords

Surgery, Ear, Tympanoplasty, Mastoidectomy

1. Introduction

Middle ear surgery comprises all surgical procedures performed on the tympanum, the tympanum and its contents or the mastoid cavities [1] [2]. It is necessary for ear conditions including cholesteatoma, tympanic perforations, and malformative disorders that impact the hearing of patients [1]. Several surgical techniques are used, it can be tympanoplasty, myringoplasty, mastoidectomy, ossiculoplasty and many others; several techniques may be combined at the same time [3]. The anatomical complexity of the ear and its relationship with noble vasculo-nervous organs, eyes, meninges and brain make it difficult to surgically manage its conditions [4]. Among its conditions, cholestéatome of the middle ear is specific because of the evolutionary risks and potentially serious complications that it causes, fully justifying the use of surgical treatment [5] [6]-[10]. Chronic otitis media can lead to conductive hearing loss of up to 60 dB, which is considered a serious disability. The tympanoplasty and/or mastoidectomy that can be performed for this purpose has developed considerably over the years and various microscopic and mini-endoscopic invasive techniques were used to obtain the best anatomical and functional results. To date, the temporal aponeurosis and pericondre remain the most commonly used materials for the closure of perforations of the tympanic membrane although other materials. The use of synthetic materials is also encouraged. The success of reconstruction is about 90% in simple tympanoplasties [7]. In Guinea, there have been recent innovations in otological surgical techniques, but otological surgery is still limited by the lack of qualified personnel and technical equipment. Our goal was to review the middle ear surgery at the ENT department of the Donka National Hospital in order to improve it.

2. Equipment and Methods

It was a descriptive and cross-sectional study with retrospective data collection. It was performed in the ENT department of the National Donka Hospital in Conakry. This study involved 71 patient files over a period of 6 years, from 1 January 2018 to 31 December 2023. We included the records of patients who had received ear surgery regardless of age or gender, including the operative report and post-operative follow-up. All incomplete or illegible records were excluded. Ear surgery is not common in our department, so we have made a comprehensive census of all the cases that met our study criteria during the 6 years. Parameters were collected on a survey sheet. The data were epidemiological, otoscopic, computed tomography, surgical indications, surgical techniques and postoperative results. We did the following: once in our department's archive room, we counted all patient records during the 6 years. Then we selected all the records of patients operated on at the ear. We then set aside patients who had been operated on at the middle ear. Of these, we retained 71 and eliminated 4 that were unexploitable. The survey sheets were exploited and analyzed by the software Epi-info version 7.2. Data entry was done using the World and Excel software. The audi-

tory gain was represented by the difference between the pre-operative and post-operative Rinne and all functional parameters appreciated on frequencies 500, 1000 and 2000 hertz.

Ethical Authorization

The ethics committee of the Donka National Hospital had approved this study.

3. Results

We surveyed 71 patients who had received middle ear surgery for 6 years out of a total of 548 ENT and cervical-facial surgeries, with a prevalence of 12.64%, the frequency was 11.83 cases/year. The mean age was 23 years (standard deviation = 17, 29), the extreme ages were 3 and 75. We identified 31 men (43.66%) and 40 women (56.34%), a sex ratio equal to 0.77. The following were: student/pupil in 26 cases (39.4%), civil servant in 16 cases (24.2%), housewife in 11 cases (16.7%), health worker in 8 cases (12.1%) and worker in 5 cases (7.6%). It should be noted that 5 children (7.6%) were without occupation. The main reasons for consultations were otorrhea 58 (81.7%), hypoacusis 58 (81.7%), otalgia 46 (64.8%), tinnitus 20 (28.1%) and otorrhagia 3 (4.2%). The patients' ENT history was: chronic otitis media 49 (69%), acute otitis media 11 (5.5%), seromucotic otitis 5 (7%) and cholesteatoma of the middle ear 3 (4.2%). The pre-operative otoscopy revealed a tympanic perforation in 76 cases: total or sub-total 23 (30.3%), marginal 15 (19.7%), central 12 (15.9%), anterior 9 (11.8%) and posterior 6 (7.9%). The tympanum was dull in 6 cases (7.9%), and a polyp of external acoustic meatus in 3 cases (3.9%). The preoperative audiogram showed transmission deafness in 63 cases (60%), mixed deafness in 28 cases (26.7%) and perception deafness in 14 cases (13.3%). The deafness was medium in 41 cases (48.8%), mild in 31 cases (36.9%) and severe in 12 cases (14.3%). Computed tomography showed 25 cases (46.3%) of open tympanum, 16 cases of cholesteatoma (29.6%), 5 cases of otomastoiditis (9.2%), 4 cases of mastoid cell osteosclerosis (7.5%), 3 cases of lysis of at least one of the bones (5.6%), the rock was normal in 1 case (1.8%). The operating indications are presented in **Table 1**.

Table 1. Patients' operating indications.

Indications	Effective	Percentage (%)
Perforation tympanique séquellaire	42	52.5
Chronic otomastoiditis	19	23.8
Cholesteatoma of the middle ear*	12	15.0
Secretory otitis median	7	8.7

Note: *In 3 cases (3.6%), cholesteatoma was recurrent.

The right ear was operated in 38 patients (49.4%) and the left ear in 39 pa-

tients (50.6%). The first retroauricular route was used in 61 cases (92.2%) and the conduit route in 7 cases (9.1%). We performed 70 tympanoplasties (90.9%) of which 45 myringoplasties (58.4%), 14 tympanoplasties type II (18.2%), 11 tympanoplasties type III (14.3%), 50 mastoidectomies (64.9%), 7 trans-tympanic aerators (9.1%). The aponeurotic graft was used in 3 cases (4.3%) and the aponeurosis + cartilage in 67 cases (95.7%). The graft position was underlaid in 67 cases (95.7%) and overlay in 27 cases (38.6%). The closed technique was performed in 38 cases (76%) and the open technique in 12 cases (24%). Immediate postoperative complications were 24 cases of vertigo (33.8%), 5 cases of tinnitus (7%), 4 cases of infection of the surgical site (5.6%) and 1 case of peripheral facial paralysis (1.4%). The results of the anatomopathological examinations of the surgical pieces were in favor of cholesteatoma in 7 cases (9.8%), of fibrosis associated with cysteonecrosis in 3 cases (4.2%) and a case of large cell diffuse lymphoma (2.2%). One month post-operative follow-up showed good healing of the retroauricular incision (100%); neotympanum was in place in 43 cases (86%), a mass was found in the left external acoustic meatus in 1 case (2.8%), the 7 trans-tympanic drains were in place and functional (100%). Pre-operative and post-operative audiograms showed a hearing gain of 1 to 5 dB in 9 cases (12.7%), 6 to 10 dB in 21 cases (29.6%), and 11 to 15 dB in 13 cases (18.3%). The hearing gain was 16 - 20 dB in 8 cases (11.6%) and 21 - 30 dB in 5 cases (7%).

4. Discussion

Middle ear surgery has recently been popularized in our activities by the advent of new techniques for the management of certain surgical pathologies. This surgery is faced with the lack of technical plateau and qualified specialists in Guinea. The lack of some details in patient records such as the type of ossiculoplasty performed was a limitation. In this study, the average age of patients was 23 years, which was slightly lower than those published by most authors [1] [6] [7] [11] where the average age was between 26 and 39 years. The female predominance found in our series (sex ratio = 0.77) was identical in studies conducted by Do Santos (sex-ratio of 0.66) [1] and Hicham (sex ratio = 0.78) [2]. However, in the study presented by Bouhafs *et al.* 1.5 [11] and that of Dioum *et al.* [3] Male dominance was observed (sex ratio = 1.44). The main reasons for consultation were otorrhea (81.7%) and hypoacusis (81.7%). This was the same in the study by Dioum *et al.* [3] where otorrhea was observed in almost all patients (97%) and deafness in 74.2%. These two reasons for consultation are predominant in the series reported by all authors [6]-[8]. These authors suggest that the otorrhea fetid translates in most cases an overinfected character in cholesteatomes and deafness most often corresponds to the inflammatory reaction or Advanced destruction of the tympanum-systemossicular. The remains of the bones can be modeled for the reconstruction of the columellar effect. Other call signs such as tinnitus, otalgia and dizziness appear to be less frequent and occur mainly during superinfections or in the presence of complications [3]. Otoscopy, which is essential before diagnosis, must be thorough and performed using the operating

microscope or otoendoscope [8]. This examination was most often performed in the chair with a headlamp in our series, however, all patients had undergone an otomicroscopy in the operating room before the surgical incision. In this series, tympanic perforation was observed in 76 cases, of which subtotal/total (30.3%) and central (15.9%). Our result was comparable to that presented by Tall *et al.* [6] where total/subtotal central perforations were predominant at 30.61% and 36.73%, respectively. Thus, the anatomical seat of the perforation, its size, the state of the tympanum-chainossicular and the state of pneumatization of mastoid cells condition the choice of the first way and the operative technique [4]-[8]. In this study, the preoperative audiogram was systematic in all patients, transmission deafness was predominant (60%) as well as medium and light deafness with respectively 48.8% and 36.9%. Our result was different from that reported by Portier *et al.* [7] where mixed deafness was predominant (63.6%), followed by transmission (27.3%) and cophosis (9.1%). According to some authors [9], the deafness is a function of the size and topography of the tympanic perforation and there is no systematic correlation between the importance of the Rinne and the extension of a cholesteatoma. Audiometric data are used in the operative indication, the presence of a Rinne above 30 dB can mean ossicular lysis or ankylosis; a scan-check is desirable in the latter case. When the ear is heavily labyrinthized, it will be necessary to reduce the manipulations of the chain during surgery [9]. In our series, all patients had performed a preoperative computed tomography. There was no correlation between the suspicion of a cholesteatoma on CT and the result of the anatomopathological examination of the middle ear lesions. Nevertheless, CT is the reference imaging examination for the study of the middle ear [4]. In chronic cholesteatomatous otitis, it allows to make a precise lesion assessment but also to help the diagnosis when the clinical examination is not sufficiently clear [8]. In this study, a case of large cell diffuse lymphoma on polyp of the tympanum case was diagnosed. This corroborates the observation reported by Buraïma *et al.* [10] Malignant middle ear disease is rare; its incidence would be one case per six million inhabitants regardless of histopathological type or location. In our series, myringoplasty was the most performed surgical technique (58.4%) among tympanoplasties, because the tympano-chainThe ossicular was intact in most cases with good pneumatization of posterior cavities. Other tympanoplasties represented 32.5% and mastoidectomies 64.9%. The first retroauricular route was the most used in our series (92.2%), this was identical in the study presented by Do Santos Zounon *et al.* [1] while in the study conducted by Dioum *et al.* [3] The retroauricular approach was systematic. The more frequent use of this route may be explained by the fact that it offers a wider and more extensive view under the microscope and allows easier access to all cavities of the middle ear and responds to all cholesteatoma extensions [12]. However, the transmesal route was most used in the study published by Tall *et al.* [6] and in the study conducted by Bouhafis *et al.* [11]. This would be justified by the fact that the choice of the route depends first on the habits of the surgeon, the seat and extension of the lesions but also the anatomical variations of each patient's

ear [4] [5] [7] [8]-[10]. In our series, the aponeurotic graft was used in 3 cases (4.3%) and the aponeurosis + cartilage in 67 cases (95.7%). In the study by Tall *et al.* [6], only the temporal aponeurosis was used as graft material [6]. According to some authors, the use of cartilage for tympanic strengthening should be the rule in children while temporal aponeurosis is preferably used in adults [4]. The problems of cartilage are the lack of control of a fluid effusion retro-tympanic and possible residual [4]. The myringoplasty in underlay by the placement of the cartilaginous graft reinforced by the temporal aponeurosis was the most used technique in our series, 95.7%. This showed that the association of cartilage and aponeurosis promotes neotympanum formation and does not influence auditory gain. This was the same in the study by Do Santos Zounon *et al.* [1]. However, the use of a single graft type, either cartilage or temporal aponeurosis, is widely used by most authors [4]-[6] [13]. Other surgical techniques have been published including the buttonhole technique [6], butterfly cartilage technique [14] [15] each of which has its advantages, especially for small perforations with intact ossicular chain. In our series, mastoidectomy in closed technique was the most performed (76%) and in open technique represented 24%. This was different from the techniques in the study by Dioum *et al.* [3] Where radical mastoidectomy was performed in 66.7%, modified radical mastoidectomy in 33.3% and mastoidectomy associated with tympanoplasty in 4.7%. This is due to the fact that it seems now accepted that the choice of technique depends on some general factors but especially on the characteristics of cholesteatoma. Moreover, it seems that the choice of technique does not influence the quality of postoperative bone curve. In these conditions, it is recommended to use a closed technique except in the presence of special circumstances (multi-operated ear, multiple fistulas, single ear) or when considering leaving the cholesteatomine matrix in place (posterior canal, promontory, cochlear fistula) or to facilitate subsequent monitoring [3]. The average follow-up of our patients was 6 months. After one month the neotympanum had formed well in 86%, and all transtympanic drains were functional. The anatomical success rate (80%) reported by Do Santos Zounon *et al.* [1] was lower than that of Mouzali *et al.* [16] where these anatomical and functional success rates obtained at one year post-operative were 80, respectively, 6% and 77.6%, while the overall anatomical success rate of myringoplasty reported by Elboukhari *et al.* [17] was higher (90.7%) after a 6-month follow-up. In our series, the auditory gain was variable between 6 and 30 dB. Our result was comparable to that reported by Do Santos Zounon *et al.* where the hearing gain was 25 dB [1]; whereas in the study by Tall *et al.* [6], the percentage of patients with a Rinne between 0 and 20 dB had increased from 10% to 58.8%. Whereas in the series of Bouhafis *et al.* [11], hearing gain greater than or equal to 20 dB was observed in 86.7% after a 12-month mean decline.

5. Conclusion

Middle ear surgery is increasingly being performed in our department. Young people are the most concerned. Tympanoplasty and mastoidectomy are the main

surgical techniques. The anatomical results and the auditory gains are appreciable. The implementation of a training strategy for young specialists could improve this surgery.

Conflicts of Interest

The authors declare no conflicts of interest regarding the publication of this paper.

References

- [1] Do Santos Zounon, A., Avakoudjo, F., Bouraima, F.A., Vodouhe, U.B., Adjibabi, W. and Vignikin-Yehouessi, B. (2021) Bilan Anatomique et fonctionnel de la tympanoplastie en technique underlay. *Journal de la Société de Biologie Clinique du Bénin*, **38**, 36-39.
- [2] Attifi, H., Hmidi, M., Boukhari, A., Touihem, N., Kettani, M., Zalagh, M., *et al.* (2014) Expérience oto-rhino-laryngologique de l'hôpital marocain de campagne en Guinée Conakry. *Pan African Medical Journal*, **19**, Article 40. <https://doi.org/10.11604/pamj.2014.19.40.4908>
- [3] Dioum, E.S., Cissé, Z., Tall, A., Ndiaye, M., Pegbessou, E., Ndiaye, I.C., Diallo, B.K., Diouf, R. and Diop, E.M. (2013) Prise en charge du cholestéatome acquis chez l'enfant: Bilan de 15 ans au service ORL du CHNU de FANN Dakar. *Journal International d'Otorhinolaryngologie Pédiatrique*, **77**, 1998-2003.
- [4] Nevoux, J., Lenoir, M., Roger, G., Denoyelle, F., Ducou Le Pointe, H. and Garabédian, E.N. (2010) Le cholestéatome chez l'enfant. *Annales Françaises d'Otorhinolaryngologie et de Pathologie Cervico-Faciale*, **127**, 182-190. <https://doi.org/10.1016/j.aforl.2010.07.001>
- [5] Ayache, D., Schmerber, S., Lavieille, J.P., Roger, G. and Gratacap, B. (2006) Cholestéatome de l'oreille moyenne. *Annales d'Otolaryngologie et de Chirurgie Cervico-Faciale*, **123**, 120-137. [https://doi.org/10.1016/s0003-438x\(06\)76653-1](https://doi.org/10.1016/s0003-438x(06)76653-1)
- [6] Tall, A., N'Diaye, M., Diom, E.S., Nao, E.E., Deguenonvo, R., Diallo, B.K., Ndiaye, I., Diouf, R. and Diop, E.M. (2012) Myringoplastie par la technique des boutonnières. *Journal Tunisien d'ORL et de Chirurgie Cervico-Faciale*, **28**, 7-12.
- [7] Portier, F., Lescanne, E., Racy, E., Nowak, C., Lamblin, B. and Bobin, S. (2005) Prise en Charge des Fistules Labyrinthiques Cholestéatomateuses: A Propos de 22 Cas. *The Journal of Otolaryngology*, **34**, 1-6. <https://doi.org/10.2310/7070.2005.00001>
- [8] Touati, M.M., Darouassi, Y., Chihani, M., Bouaity, B. and Ammar, H. (2015) L'otite moyenne chronique cholestéatomateuse de l'enfant: À propos de 30 cas. *Pan African Medical Journal*, **21**, Article 24. <https://doi.org/10.11604/pamj.2015.21.24.5689>
- [9] Tringali, S., Dubreuil, C. and Bordure, P. (2008) Les perforations tympaniques et les greffes de tympan. *Annales d'Otolaryngologie et de Chirurgie Cervico-Faciale*, **125**, 261-272. <https://doi.org/10.1016/j.aorl.2008.01.005>
- [10] Buraïma, F., Kouassi, Y.M., Coulibaly, A., *et al.* (2011) Un cas d'angiosarcome de l'oreille moyenne. *Annales Françaises d'Otorhinolaryngologie et de Pathologie Cervico-Faciale*, **128**, 99-102. <https://doi.org/10.1016/j.aforl.2010.09.011>
- [11] Bouhaf, K., Lachkar, A., Benallal, A., Benfadil, D. and Ghailan, M.R. (2021) Ossiculoplasties: À propos de 30 cas et revue de la littérature. *Pan African Medical Journal*, **38**, Article 187. <https://doi.org/10.11604/pamj.2021.38.187.27449>
- [12] Beltaief, N., Sellami, M., Tababi, S., Zainine, R., Charedim, A., Sahtout, S., Charfi, A.

- and Besbes, G. (2012) Le cholestéatome de l'oreille moyenne. *Journal Tunisien d'ORL et de Chirurgie Cervico-Faciale*, **28**, 1-6. <https://www.ajol.info/index.php/jtdorl>
- [13] Dornhoffer, J.L. (2006) Cartilage Tympanoplasty. *Otolaryngologic Clinics of North America*, **39**, 1161-1176. <https://doi.org/10.1016/j.otc.2006.08.006>
- [14] Riss, J.C., Roman, S., Morredu, E., Farinetti, A., Nicollas, R. and Triglia, J.M. (2016) Tympanoplastie type "butterfly cartilage" chez l'enfant: À partir d'une série de 28 cas avec revue de la littérature. *Annales Françaises d'Otorhinolaryngologie et de Pathologie Cervico-Faciale*, **133**, 160-163. <https://doi.org/10.1016/j.aforl.2015.06.004>
- [15] Linder, T., Schlegel, C. and Brändle, P. (2011) Otite moyenne chronique simple contre cholestéatomateuse. *Forum Médical Suisse—Swiss Medical Forum*, **11**, 584-587. <https://doi.org/10.4414/fms.2011.07596>
- [16] Mouzali, A., Kanoun, K., Haraoubia, M., Ouennoughiv, K. and Zemirli, O. (2014) Tympanoplasties chez l'enfant: À propos de 70 cas. *Annales Françaises d'Otorhinolaryngologie et de Pathologie Cervico-Faciale*, **131**, A135. <https://doi.org/10.1016/j.aforl.2014.07.297>
- [17] Elboukhari, A., Touihem, N., Nadour, K., Attifi, H., Zalagh, M. and Messary, A. (2017) Myringoplastie: Les facteurs influençant les résultats anatomiques d'une série de 229 cas. *Research*, **4**. <https://doi.org/10.13070/rs.fr.4.2314>

Annex

Otological Surgery Questionnaire

Abbreviations list: M = Male; F = Feminine; OD = Right ear; OG = Left ear; WHO = Acute otitis media; WHO = Seromucous otitis; Chole = Cholesteatoma; L = Left; D = Right; MAP = Average hearing loss; ST = Conductive hearing loss; SP = Sensorineural hearing loss; SM = Mixed deafness; CT = Computed tomography.

A. No. =, Age = (years), Gender = M/F, Profession =

B. Reasons for consultation: Deafness = 1, Otorrhea = 2, Ear Pain = 3, Tinnitus = 4, Others =

C. History: OMC = 1, OMA = 2, OSM = 3, Chole = 4, Others =

D. Otoscopy:

Tympanic perforation: G = 1, D = 2, Bilateral = 3

- Total or subtotal = 1
- Central = 2
- Marginal = 3
- Previous = 4
- Posterior = 5
- Dull eardrum = 6
- MAE polyp = 7

E. Pure-tone audiometry: ST = 1, SP = 2, SM = 3

- PAM (dB) pre-op: 500 Hz = 1, Kz = 2, Kz = 4, Kz =
- PAM (dB) post-op: 500 Hz = 1, Kz = 2, Kz = 4, Kz =

F. CT:

- Open eardrum = 1, Chole = 2, Otomastoiditis = 3
- Ossicular lysis: Malleus = 1, Anvil = 2, Stirrup = 3

G. Operating indications:

- Sequelary tympanic perforation = 1, Middle ear cholesteatoma = 2, Chronic otomastoiditis = 3, Seromucosal otitis = 4, Other =

H. Operated side: OG = 1, OD = 2

I. Approach: Retroauricular = 1, Endoral = 2

J. Operating technique:

- Tympanoplasty T1 = 1, Tympanoplasty T2 = 2, Tympanoplasty T3 = 3
- Mastoidectomy: Open = 1, Closed = 2

K. Post-op complications:

- Vertigo = 1, Tinnitus = 2, PFP = 3, Suppuration = 4

L. Post-operative results:

- Neotympanum in place = 1, Perforation = 2, Recurrence of cholesteatoma = 3, Residual cholesteatoma = 4

M. Post-op audimetry: Hearing gain = (dB)