SAVITSKAYA, Tatyana, KUTAJ, Aleksandra, SAVITSKI, Kiryl, BŁASZCZYK, Wiktoria, WICZKOWSKI, Dawid, ŁAPA, Wiktor, and PIKENINA, Daria. Middle Ear Paraganglioma: Diagnostic Challenges and Surgical Management – A Case Report. Quality in Sport. 2025;48:67370. eISSN 2450-3118.
https://doi.org/10.12775/QS.2025.48.67370
https://apcz.umk.pl/QS/article/view/67370

The journal has been awarded 20 points in the parametric evaluation by the Ministry of Higher Education and Science of Poland. This is according to the Annex to the announcement of the Minister of Higher Education and Science dated 05.01.2024, No. 32553. The journal has a Unique Identifier: 201398. Scientific disciplines assigned: Economics and Finance (Field of Social Sciences); Management and Quality Sciences (Field of Social Sciences).
Punkty Ministerialne z 2019 - aktualny rok 20 punktów. Załącznik do komunikatu Ministra Szkolnictwa Wyższego i Nauki z dnia 05.01.2024 l.p. 32553. Posiada Unikatowy Identyfikator Czasopisma: 201398. Przypisane dyscypliny naukowe: Ekonomia i finanse (Dziedzina nauk społecznych); Nauki o zarządzaniu i jakości (Dziedzina nauk społecznych).
The authors declare that there is no conflict of interest regarding the publication of this paper.
Received: 11.12.2025. Revised: 22.12.2025. Accepted: 28.12.2025. Published: 28.12.2025.

Middle Ear Paraganglioma: Diagnostic Challenges and Surgical Management- A Case Report

Tatyana Savitskaya [TS]

ORCID: https://orcid.org/0009-0008-8728-7329

bagrova.t96@gmail.com

Grodno State Medical University: Hrodna, Grodnenskaya, BY

Aleksandra Kutaj [AK]

ORCID: https://orcid.org/0009-0001-5145-0752

ola.kutaj1@gmail.com

Poznan University of Medical Sciences, Collegium Maius

10 Fredry Street, 61-701 Poznań, Poland

Kiryl Savitski [KS]

ORCID: https://orcid.org/0009-0006-8733-2981

narutotbi14@gmail.com

Grodno State Medical University: Hrodna, Grodnenskaya, BY

Wiktoria Błaszczyk [WB]

ORCID: https://orcid.org/0009-0000-6340-7957

wiktoriablaszczyk99@gmail.com

Andrzej Frycz Modrzewski University

Gustawa Herlinga-Grudzińskiego 1, 30-705 Kraków

Dawid Wiczkowski [DW]
ORCID: https://orcid.org/0009-0004-7050-9598
dawid.wiczkowski@gmail.com
Independent Public Specialist Western Hospital of John Paul II in Grodzisk Mazowiecki

Wiktor Łapa [WŁ]
ORCID: https://orcid.org/0009-0000-8806-2713
wiktor.lapa4@gmail.com
Poznan University of Medical Sciences, Collegium Maius
Fredry 10, 61-701 Poznan

Daria Pikenina [DP]
ORCID: https://orcid.org/0009-0002-9447-2182
dashapikenina@gmail.com
Andrzej Frycz Modrzewski University
Gustawa Herlinga-Grudzińskiego 1, 30-705 Kraków

ABSTRACT

Introduction and Purpose. Middle ear paraganglioma (glomus tympanicum) is a rare, benign, highly vascular neuroendocrine tumor arising on the cochlear promontory. Despite its benign nature, it may cause local destruction and symptoms such as pulsatile tinnitus, conductive hearing loss, or a retrotympanic mass. Computed tomography (CT) and magnetic resonance imaging (MRI) are essential for diagnosis. The aim of this study is to present a clinical case and **underline the role of imaging, embolization, and surgery.**

Materials and Methods. A single case was analyzed, including clinical data, otoscopic findings, CT, angiography, details of embolization and surgery, and histopathological results. High-resolution CT was used to assess bony involvement, while angiography defined vascular supply and enabled preoperative embolization. The tumor was surgically removed, and histopathology confirmed paraganglioma.

Results. The patient presented with pulsatile tinnitus, progressive hearing loss, and intermittent otorrhea. Otoscopy revealed a pink, pulsatile mass within the external auditory canal. CT showed a well-defined with limited bony erosion. Angiography demonstrated marked

vascularity arising from branches of the middle meningeal artery. Embolization effectively reduced tumor perfusion. The mass was completely removed surgically, requiring resection of a diseased incus and reconstruction of the middle ear. Recovery was uneventful.

Conclusion. Middle ear paraganglioma should be considered in patients with pulsatile tinnitus and vascular retrotympanic masses. CT and MRI are essential for evaluating lesion extent, while angiography and embolization reduce intraoperative bleeding and facilitate safer surgery. Surgical excision remains the treatment of choice for class A/B tumors. The present case supports the effectiveness of a multistep approach incorporating imaging, vascular control, and precise surgical technique.

Keywords: glomus tympanicum, middle ear paraganglioma, pulsatile tinnitus, embolization, temporal bone tumor, otologic surgery

Introduction

Paragangliomas constitute a subgroup of neuroendocrine tumors characterized by a highly vascular architecture; these neoplasms originate from the chief cells of the paraganglia of the autonomic nervous system. Glomus tympanicum tumor, also referred to as tympanic paraganglioma, is one of the most common benign tumors of the head and neck region, particularly within the mesotympanum of the middle ear. Although glomus tympanicum tumors are typically benign and only rarely cause autonomic disturbances associated with catecholamine secretion, their continuous growth may become clinically significant due to the close anatomical proximity of the cochlea, jugular bulb, cranial nerves, and the carotid artery [1–3].

This tumor grows slowly and typically occurs sporadically, accounting for approximately 1-3% of all head and neck neoplasms [4]. Chemodectoma is the most common tumor of the middle ear (10–15%) and the second most frequent neoplasm of the temporal bone [2].

The lesions may occur unilaterally, bilaterally, or present as multifocal disease (approximately 10%). A genetic background is identified in 30–40% of patients, and the tumor may coexist with syndromes such as Multiple Endocrine Neoplasia type 2 (MEN II), von Hippel–Lindau disease (VHL), or Neurofibromatosis type 1 (NF-1) [5].

The highest incidence is observed in the fifth decade of life, and the condition occurs significantly more often in women. Approximately 3% of these tumors exhibit hormonal activity [6].

The most commonly reported symptoms include pulsatile tinnitus and hearing loss. Otoscopic examination typically reveals erythema, bulging, and sometimes visible pulsation of the tympanic membrane [2].

A thorough medical history, physical examination, and evaluation of imaging studies are key components in the diagnostic workup of these tumors. Magnetic resonance imaging (MRI) and computed tomography (CT) are complementary modalities for assessing the extent of the lesion prior to surgical planning. CT allows visualization of the tumor mass located on the promontory, its contrast enhancement, and detailed assessment of the bony structures of the middle and inner ear as well as the jugular foramen region. MRI, in turn, enables precise evaluation of the tumor's relationship to soft tissues and vascular structures, as well as potential intra- and extracranial extension [7].

The primary treatment modality is surgical excision of the tumor, performed either through a transcanal approach or via a retroauricular route. The procedure is most commonly conducted using an operating microscope; however, the use of an endoscope offers certain advantages. These include a wider field of view, superior visualization, and the ability to introduce instruments into anatomically confined areas of the middle ear that are typically less accessible under microscopic guidance [8].

Case Description

A female patient was admitted to the Department of Otolaryngology reporting pulsatile tinnitus in the left ear, progressive hearing loss, and intermittent otorrhea. According to the patient, the symptoms had begun several years earlier, but had markedly worsened over the past few months.

In 1981, the patient underwent surgery to remove a lesion from the left ear; histopathological examination dated 12 February 1981 indicated an *angioma*. She also received adjuvant radiotherapy targeted to the left ear as part of her previous treatment.

During the clinical examination, a pink, smooth-walled, soft-elastic, pulsatile proliferative lesion on a broad base was observed within the bony portion of the left external auditory canal,

arising from the postero-inferior canal wall. Due to this mass, the tympanic membrane could not be visualized.

A computed tomography (CT) scan was performed. CT imaging of the left temporal bone (Fig. 1) revealed a heterogeneous, well-demarcated soft-tissue lesion occupying the tympanic cavity and the bony segment of the external auditory canal. The lesion filled the middle ear spaces, remodeling and narrowing the canal lumen. Evidence of erosion and bony remodeling of the postero-inferior external auditory canal wall and middle ear structures was present, suggesting a slowly progressive proliferative process.

The auditory ossicles are partially surrounded by the pathological soft-tissue mass, without clear evidence of their destruction. The mastoid air cells show features of sclerosis. No enlargement of the carotid canal or the jugular bulb is observed.

The CT findings are most suggestive of a vascular lesion, such as a glomus tympanicum tumor or another neoplasm of vascular origin.

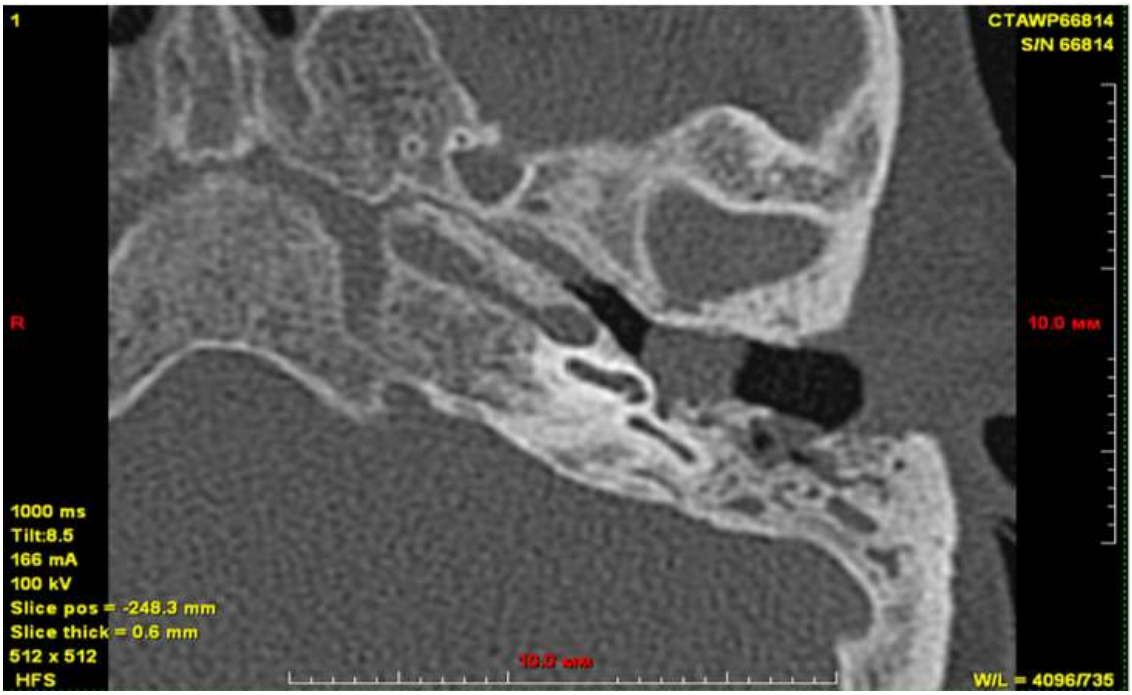


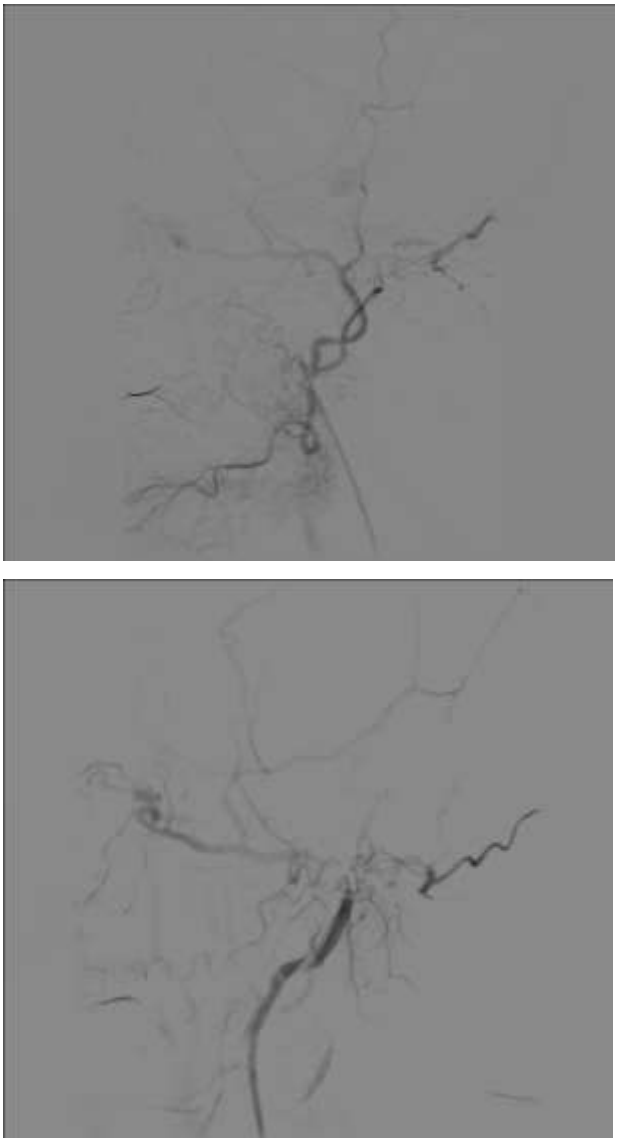
Figure 1. Axial computed tomography scan of the temporal bone (left side)

Angiographic evaluation of the external carotid artery revealed pathologically increased vascularity within the region of the tympanic cavity and external auditory canal, corresponding

to a proliferative lesion consistent with a vascular tumor. The vascular supply originated primarily from branches of the left middle meningeal artery, which demonstrated an intense vascular phase with rapid filling of small, tortuous feeding vessels and a characteristic *tumor blush* appearance.

Selective catheterization of the left middle meningeal artery was performed, followed by embolization using calibrated PVA microspheres. This resulted in a marked reduction in tumor vascularity and disappearance of the *tumor blush* on post-embolization control angiography.

Embolization was carried out as a preparatory step prior to the planned surgical treatment to minimize intraoperative bleeding.



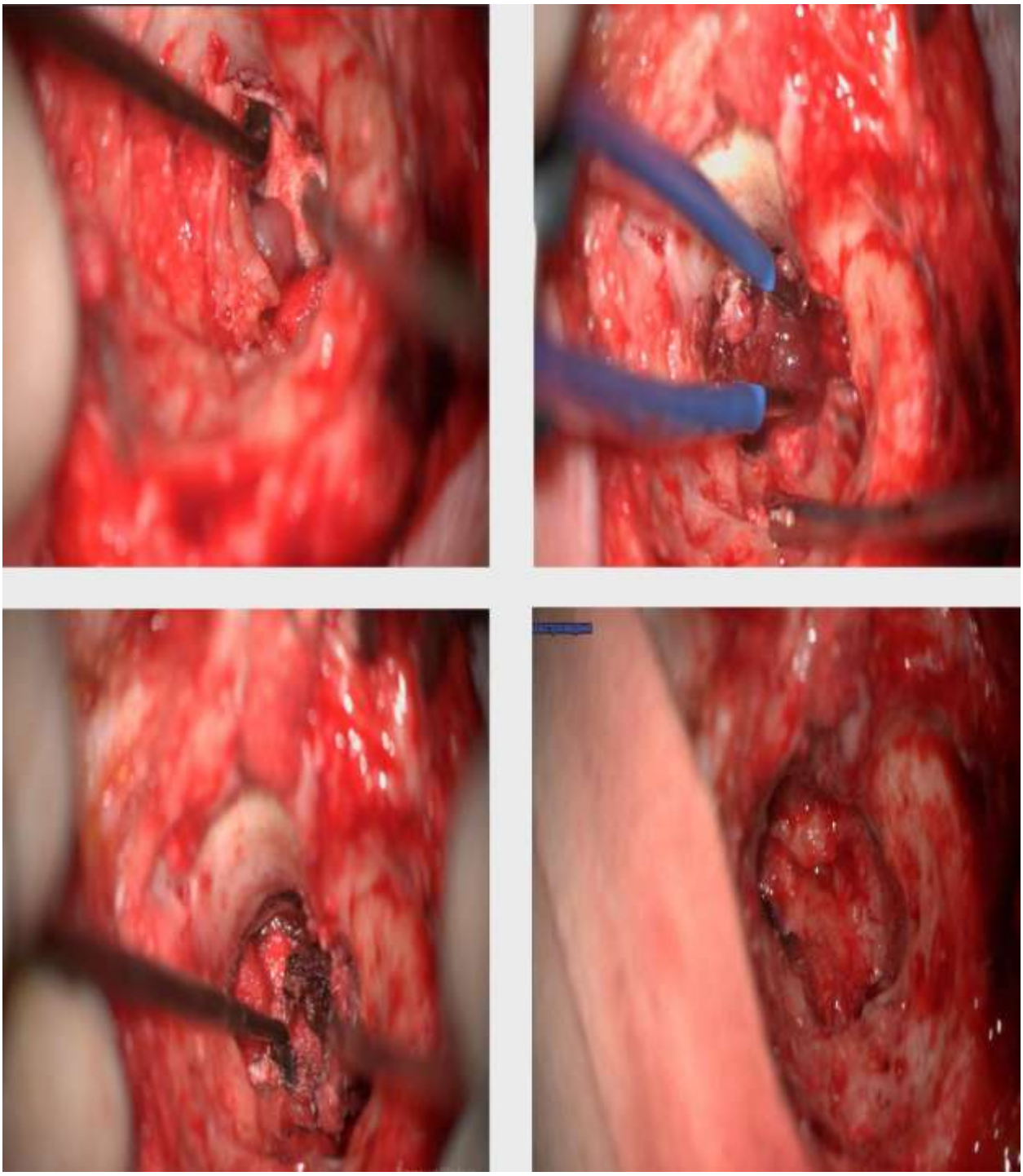
Figures 2–3. External carotid artery angiography

The patient underwent surgery under endotracheal general anesthesia. A postauricular incision was made, the spina suprameatum was exposed, and the antrum was opened. The posterior bony wall of the external auditory canal was removed, and the bony overhang was smoothed.

In the tympanic cavity, pink, pulsatile lesions were observed, filling its lumen and partially extending into the external auditory canal. The mass was firmly adherent to the tympanic membrane and the walls of the tympanic cavity. The lesion was removed using blunt dissection and electrocautery, together with a carious incus that had been destroyed. Bleeding was minimal; the tumor pedicle was coagulated.

The opening of the Eustachian tube was reinforced with a fragment of mucosa. A T-plasty of the external auditory canal skin was performed, and the tympanic cavity was packed. Skin sutures and an aseptic dressing were applied. The intraoperative course was uneventful.

Histopathological diagnosis: paraganglioma.



Figures 4–7. Intraoperative photographs demonstrating the tumor during the procedure.

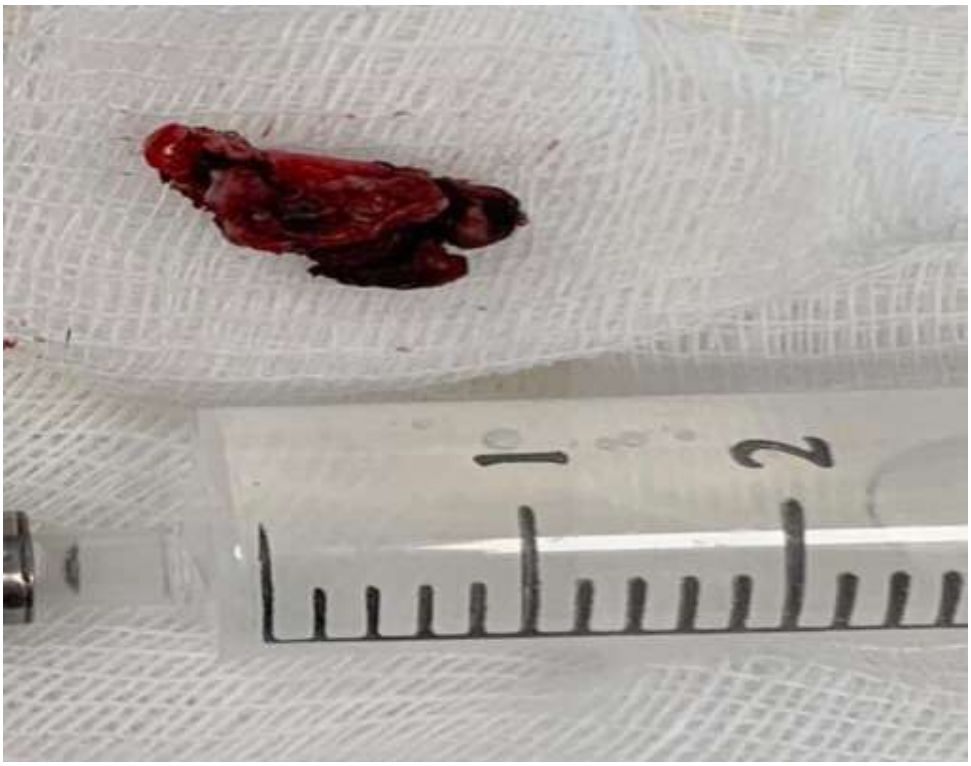


Figure 8. Postoperative photograph of the excised lesion.

In the postoperative period, the patient remained in satisfactory condition, and no bleeding was observed. Skin sutures were removed on postoperative day 7, and the packing on day 14. The patient was discharged in good overall condition.

The first descriptions of paragangliomas within the temporal bone were provided by Stacy R. Guild, who in 1941 reported the presence of an oval lesion located in the jugular bulb and on the promontory of the middle ear, extending along Jacobson's nerve-a branch of the glossopharyngeal nerve. He termed this lesion "glomus jugularis " [9].

Four years later, Harry Rosenwasser published a case report of a 36-year-old man with a middle ear tumor extending into the external auditory canal. During surgery, he noted tight adhesion of the mass in the hypotympanum region and very profuse bleeding. Histopathological examination revealed neoplastic paraganglionic cells consistent with a „carotid body tumor" [9].

The diagnosis of glomus tympanicum is based on clinical evaluation, audiological testing, and imaging studies. Imaging techniques such as computed tomography and magnetic resonance imaging play a pivotal role in early detection. On radiological assessment, paragangliomas

typically present as highly vascular tumors with intense contrast enhancement. Imaging is also valuable for monitoring tumors within the middle ear. Temporal bone CT is frequently used to evaluate progression [10].

Glomus tumors are slow-growing, benign lesions and represent the most common primary neoplasms of the middle ear. According to the literature, the initial symptoms typically include pulsatile tinnitus synchronized with the heartbeat, hearing loss (conductive, sensorineural, or mixed), and otalgia. The most characteristic otoscopic finding is a pulsatile mass visible behind the tympanic membrane, usually located in the inferior quadrant [11].

In contrast to certain other head and neck paragangliomas-such as carotid body tumors, jugular paragangliomas, or vagal paragangliomas-which often require multidisciplinary management involving oncologists, neurosurgeons, vascular surgeons, and radiologists, the treatment of middle ear paragangliomas relies primarily on single-specialty care consisting of otologic microsurgery [11].

Analysis of available data indicates that extended tympanotomy techniques allow complete excision of most middle ear paragangliomas (classes A and B) without significant deterioration of auditory function.

In cases where the tumor extends into the mastoid process-into the infralabyrinthine space (class B)-or when there is concern regarding the integrity of the inferior wall of the tympanic cavity or the lateral wall of the internal carotid artery canal, a more advanced surgical approach using radical petrotympanotomy is preferred. In our experience, this method provides optimal access to the key anatomical structures of the middle ear (the inferior wall of the tympanic cavity), the mastoid process, and the temporal bone (the lateral wall of the internal carotid artery canal) when neoplastic progression is suspected [7,12].

Conclusions

Middle ear paragangliomas (glomus tympanicum), although rare, should be considered in the differential diagnosis of any vascular lesion within the ear-particularly in patients presenting with pulsatile tinnitus and progressive hearing loss. A thorough medical history, otoscopic evaluation, and high-resolution imaging studies (CT and MRI) are essential for accurate diagnosis and assessment of tumor extent. These imaging modalities provide complementary

information: CT enables detailed evaluation of bony structures, whereas MRI delineates the involvement of soft tissues.

Angiography combined with preoperative embolization serves as a valuable preparatory tool in the management of vascular tumors of the middle ear. In the present case, embolization of the left middle meningeal artery significantly reduced tumor vascularity, contributing to a safer surgical procedure with minimal intraoperative bleeding.

Surgical treatment remains the method of choice for class A and B tympanic paragangliomas. Proper selection of the operative technique-including radical tympanotomy or, when necessary, extended petrotympanotomy-allows complete tumor resection while minimizing the risk of injury to critical otologic structures. Histopathological confirmation is a necessary component of the diagnostic and therapeutic process; in this case, the final diagnosis of paraganglioma was consistent with the clinical and radiological findings.

The presented case highlights the importance of a multistep, integrated approach-combining imaging assessment, vascular evaluation, and surgical management-to achieve favorable therapeutic outcomes with a low risk of complications.

Author's contribution:

Conceptualization, supervision and project administration- AK, TS

Methodology- TS

Software, validation-AK, TS

Formal analysis, investigation, resources-TS, KS

Writing original draft preparation- AK, TS, DW, WŁ, WB, DP, KS

Writing review, editing and visualization- AK, WB, TS, KS

All authors have read and agreed with the published version of the manuscript

Funding: This research received no external funding. Institutional Rewiew Board. Statement: Not applicable.

Informed Consent Statement: Not applicable.

Data Availability Statement: Not applicable.

Acknowledgments: Not applicable.

Conflict of Interest: The authors declare no conflict of interest

References

1. Lee SJ, Lee SY, An GS, Lee K, Choi BY, Koo JW, et al. Treatment Outcomes of Patients with Glomus Tympanicum Tumors Presenting with Pulsatile Tinnitus. J Clin Med. 27 maja 2021;10(11):2348.
2. Sweeney AD, Carlson ML, Wanna GB, Bennett ML. Glomus Tympanicum Tumors. Otolaryngol Clin North Am. kwietnia 2015;48(2):293–304.
3. Offergeld C, Brase C, Yaremchuk S, Mader I, Rischke HC, Gläsker S, et al. Head and neck paragangliomas: clinical and molecular genetic classification. Clinics. kwietnia 2012;67:19–28.
4. Pellitteri P. Paragangliomas of the head and neck. Oral Oncol. lipca 2004;40(6):563–75.
5. Boedeker CC, Erlic Z, Richard S, Kontny U, Gimenez-Roqueplo AP, Cascon A, et al. Head and Neck Paragangliomas in Von Hippel-Lindau Disease and Multiple Endocrine Neoplasia Type 2. J Clin Endocrinol Metab. 1 czerwca 2009;94(6):1938–44.
6. Carlson ML, Sweeney AD, Pelosi S, Wanna GB, Glasscock ME, Haynes DS. Glomus Tympanicum: A Review of 115 Cases over 4 Decades. Otolaryngol Neck Surg. stycznia 2015;152(1):136–42.
7. Łukawska-Popieluch I, Bartoszewicz R, Morawski K, Niemczyk K. Glomus tympanicum – clinical characteristics and surgical management. Pol Przegląd Otorynolaryngologiczny. 31 marca 2018;7(1):8–15.
8. Sahoo PR, Sahu M, Khan IW, Samantaray K. Glomus tympanicum removal using transcanal endoscopic assisted surgery: An experience with six cases. World J Otorhinolaryngol - Head Neck Surg. grudnia 2023;9(4):302–7.
9. Ruben RJ. The history of the glomus tumors – nonchromaffim chemodectoma: a glimpse of biomedical Camelot. Acta Otolaryngol (Stockh). stycznia 2007;127(4):411–6.
10. Alebie HK, Fröschl U, Biru MT, Birhanu W, Abeje YA, Ayele HB. A case report on surgical management of glomus tympanicum and literature review. Int J Surg Case Rep. lutego 2025;127:110844.

11. Sanna M, Fois P, Pasanisi E, Russo A, Bacciu A. Middle ear and mastoid glomus tumors (glomus tympanicum): An algorithm for the surgical management. Auris Nasus Larynx. grudnia 2010;37(6):661–8.
12. Rzayev RM, Rzayev RtR. Paraganglioma of the middle ear. The retrospective analysis of the results of the surgical treatment. Vestn Otorinolaringol. 2016;81(2):26.