GLOMUS TYMPANICUM: AN OVERVIEW

Nguyen Ngoc Ha[1], Nguyen Hoang Huy[2], Nguyen Tuan Son[1],
Phung Thi Hoa[1], Nguyen Nhu Dua[1], Doan Trung Hieu[3]

1. Department of Otorhinolaryngology, University of Medicine and Pharmacy, Vietnam National University, Hanoi
2. National Otorhinolaryngology Hospital of Vietnam
3. Vietnam Cuba Friendship Hospital

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ABSTRACT

Objective: To review the clinical, radiological, and therapeutic characteristics of glomus tympanicum tumors, providing an updated overview of current diagnostic and treatment approaches in Vietnam and internationally. **Methods:** A comprehensive literature review was conducted using publications from 2010–2025 retrieved from databases including PubMed, Scopus, ScienceDirect, and Vietnamese Otorhinolaryngology journals. Studies were synthesized and compared based on specific criteria: epidemiology, clinical presentation, imaging features (CT–MRI), treatment modalities, and complications. **Results:** Glomus tympanicum is a benign, slow-growing vascular tumor, predominantly affecting middle-aged women. The primary symptoms are pulsatile tinnitus and conductive hearing loss. High-resolution CT and MRI play crucial roles in definitive diagnosis, staging, and surgical planning. Surgical excision remains the mainstay of treatment, achieving tumor control rates exceeding 90%. Preoperative embolization and endoscopic ear surgery (EES) have been shown to minimize intraoperative bleeding, reduce complications, and improve hearing preservation. The most common postoperative complications are transient hearing loss and residual tinnitus; facial nerve palsy is rare (<8%) and typically reversible. **Conclusion:** Early diagnosis facilitated by advanced imaging and otoscopic evaluation significantly improves treatment outcomes. Current trends favor minimally invasive approaches, specifically combined endoscopic–microscopic surgery, which demonstrates high efficacy. Further multicenter studies are recommended for long-term outcome assessment and recurrence monitoring.

Keywords: Glomus tympanicum, middle ear paraganglioma, pulsatile tinnitus, CT, MRI, endoscopic ear surgery.

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* First author: Nguyen Ngoc Ha Phone number: 0966969567 Email: nguyenhangoc812@gmail.com
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1. INTRODUCTION

Glomus tympanicum (GT) is a benign, highly vascular neoplasm arising from the paraganglionic cells located along the tympanic branch of the glossopharyngeal nerve (Jacobson's nerve). Although rare, it represents the most common tumor of the middle ear within the head and neck paraganglioma group.

The disease is characterized by slow progression but can severely impact auditory function, manifesting as **pulsatile tinnitus** and **conductive hearing loss**. In advanced cases, extratympanic invasion may occur, leading to deformation or compression of critical skull base structures. Early diagnosis and appropriate intervention are paramount for preserving hearing function and minimizing complications.

In recent years, advancements in diagnostic imaging, such as Computed Tomography (CT) and Magnetic Resonance Imaging (MRI), combined with progress in otologic and skull base microsurgery, have significantly enhanced the precision and efficacy of GT management. However, controversies persist regarding the indications for conservative management versus surgery, the selection of surgical approaches, and the role of radiotherapy in specific cases.

Study Objective: *To describe the clinical characteristics, diagnostic imaging features, and treatment modalities of glomus tympanicum.*

2. SUBJECTS AND METHODS

2.1. Study Subjects

The subjects of this review include scientific articles, research studies, case reports, and systematic reviews related to glomus tympanicum published both domestically and internationally. The selection criteria prioritized literature published between **2010 and 2025**, focusing on studies describing clinical features, imaging characteristics, histopathology, and treatment outcomes (surgery, radiotherapy, or conservative treatment). Articles with incomplete data, duplications, or lack of direct relevance to glomus tympanicum were excluded.

2.2. Methods

The study was conducted using **literature review** method.

- **Data Sources:** International medical databases (PubMed, Scopus, ScienceDirect, Google Scholar) and domestic Vietnamese Otorhinolaryngology journals.
- **Keywords:** "Glomus tympanicum", "middle ear paraganglioma", "jugulotympanic tumor", "u cuộn nhĩ", "u cận hạch tai giữa"
- **Processing method:** Articles are read, analyzed, and synthesized according to the following criteria: pathological characteristics, clinical symptoms, diagnostic means, treatment direction, and post-treatment results.
- **Data analysis:** Qualitative data are synthesized, described, compared, and contrasted with current guidelines, in order to draw general conclusions and propose directions

for further clinical research.

3. RESULTS AND DISCUSSION

3.1. Epidemiology

Table 1

Author (Year)	Study Type	Key Epidemiological Findings	Remarks
Graham NJ et al., 2022	Int. Review	Rare; typically middle-aged; Female > Male; familial/genetic link in some cases.	Useful for comparing tumor sites and highlighting genetic factors.
Zhong S et al., 2023 (update temporal bone paragangliomas).	Review/Case Series	Rare, slow-growing; onset typically 40–60 years old; low malignancy rate.	Provides modern data on age and clinical trends.
Singh VK, 2011	Case Report/Review	Emphasizes rarity; historical incidence estimates vary widely (e.g 1/30,000 to 1/1,300,000).	Highlights the variance in incidence reporting due to different methodologies.
Tram NTQ, 2022 (VN)	Descriptive study/case series (e.g 16 cases, at NOH)	Confirms rarity in Vietnam; patients present early due to pulsatile tinnitus and visible mass.	Valuable local data on clinical presentation; limited by small sample size.
Huyen PX, 2023 (VN) – Article on endoscopic surgery for Glomus tympanicum**.**	Tech. Report/Case series	Female predominance; tinnitus and hearing loss are primary symptoms.	Useful for surgical correlation; does not provide population incidence.

Comment:

1. Domestic and international sources consistently describe glomus tympanicum as a **rare tumor** affecting predominantly **middle-aged females**, **pulsatile tinnitus** and **hearing loss** as hallmark symptoms.
2. **Variation in frequency estimates:** Incidence estimates vary (e.g., 1/30,000 – 1/130,000 or even 1/1,300,000) depending on the literature and recording methods — reflecting the lack of standardized demographic data, especially in many countries where data collection is limited.
3. **Value of domestic data**: Vietnamese case series (small sample size) are suitable for describing clinical manifestations and treatment experiences, but are not large enough to estimate population frequency; epidemiological studies with multicenter cohort/cohort design or register are needed for more accurate data.

3.2. Clinical Presentation

Table 2. Primary Presenting Symptoms

Author (Year, Country)	Number of study cases	Common Symptoms (%)	Remarks
Carlson ML et al., 2015, (USA)	56	Pulsatile tinnitus (90%); CHL (75%); Otalgia (10%)	Pulsatile tinnitus is the earliest and most specific sign, the disease progresses slowly and less pain.
Zhong S et al., 2023 (China)	48 (temporal bone paraganglioma)	Pulsatile tinnitus (92%); Hearing loss (78%); Retrotympanic mass (60%)	Typical symptoms facilitate early diagnosis via otoscopy.
Nguyễn Hữu Khánh Tùng, 2023 (Viet Nam)	12 (Ear Nose Throat Hospital HCMC.)	Pulsatile tinnitus (100%); Hearing loss (83%); Red mass (67%)	Vietnamese patients present early mainly due to tinnitus; early diagnosis via otoscopy.
Trâm NTQ, 2022 (Viet Nam)	16 (VN NOH)	Tinnitus (94%); Hearing loss (81%); Vertigo (19%)	Consistent with international literature, especially middle-aged females
Graham NJ et al., 2022 (UK)	120 cases from 10 researches	Tinnitus (88%); Hearing loss (70%); Facial palsy (8%)	Symptoms correlate with Glasscock–Jackson staging, tinnitus is still the earliest indicator sign.

Comment:

- **Pulsatile tinnitus** is the most prevalent symptom (88–100%), often the primary reason for consultation.
- **Conductive hearing loss** affects 70–85% of patients due to ossicular chain interference, reflects the degree of invasion into the middle ear.
- A characteristic **reddish retrotympanic mass** (Rising Sun sign) is visible in early stages (Glasscock–Jackson I–II), help differentiate from other causes of tinnitus.
- **Cranial nerve deficits (CN VII) are rare and suggest extensive disease.**
- Vietnamese data (Nguyen Huu Khanh Tung, Tram NTQ) shows that **Vietnamese patients come to the doctor earlier**, thanks to the application of **modern ear endoscopy and imaging**, which helps detect early stage lesions.

3.3. Treatment Modalities

Table 3. Comparison of Treatment Approaches

Author (Year, Country)	Number of studies / type of study	Primary Method	Outcomes & Complications	Recommendations
Jackson CG, 2019 (USA)	Overview of 75 cases at House Ear Clinic	Retroauricular mastoidectomy ± preoperative Preoperative embolization	94% control; 3% recurrence; 12% transient hearing loss.	Surgery is the "Gold Standard"; embolization reduces blood loss.
Carlson ML et al., 2015 (USA)	56 cases	Combined Micro-Endoscopic, surgical approach according to the Glasscock–Jackson classification	70% hearing recovery; No CN VII palsy.	Combined approach improves visualization and reduces recurrence.
Graham NJ et al., 2022 (UK)	120 cases	Surgery / Radiotherapy or conservative treatment (depending on tumor size)	95% for Radiotherapy; 97% for surgery; CN VII complications <5%	Individualize: Radiotherapy for elderly/frail; Surgery for young/fit.
Lê Minh Đức, 2024 (Viet Nam)	10 cases at University of Medicine and Pharmacy Hospital - VNU Hanoi	Transcanal Endoscopic Surgery	9/10 complete removal; 70% hearing improvement; No CN VII palsy	Endoscopy is minimally invasive, ideal for Stage I–II.
Trâm NTQ, 2022 (Viet Nam)	16 cases	Mastoidectomy (canal wall up/down) and complete tumor resection	93% tinnitus resolution; 81% hearing improvement; no recurrence after 12 months	Open approach remains effective; long-term follow-up needed.

Comment:

- **Surgical excision** is the definitive treatment (Glasscock–Jackson I–III).
- **Preoperative embolization** is critical for large vascular tumors.
- **Endoscopic Ear Surgery (EES)** is gaining prominence for small tumors due to cosmetic and functional benefits.
- **Radiotherapy** is reserved for elderly or surgical candidates, offering control without tumor elimination.
- In Vietnam, the **combined endoscopic–microscopic approach** is the current trend depending on the stage, with positive results and low complication rates.

3.4. Complications

Table 4. Post-Treatment Complications

Author (Year, Country)	n	Key Complications	Rate	Remarks
Boedeker CC et al., 2020 (Germany)	102 cases of glomus tympanicum and middle ear paraganglioma	Permanent HL; Mild CN VII palsy; CSF leak.	HL: 18%; CN VII: 6%; CSF leak: 2%; Recurrence: 4%	Low complications thanks to modern microsurgical techniques and preoperative embolization. Follow-up of ≥5 years is recommended to detect late recurrence.
Nguyễn Văn Thắng, 2023 (Viet Nam)	15 cases of Endoscopic Surgery at VN NOH	Transient HL; Bleeding; Infection.	HL: 13% (resolution within 1 month); Bleeding: 7%; Infection: 7%	Endoscopic surgery is safe, good tumor control, few serious complications; recommended for stage I-II tumors.
Graham NJ et al., 2022 (UK)	120 cases (Surgery + Radiotherapy)	CN VII palsy; Mixed HL; Post-operative Chronic Otitis Media	CN VII: 5–8%; HL: 30%	Rates depend on tumor stage and surgeon experience.
Jackson CG, 2019 (USA)	75 cases of mastoidectomy	Blood loss (>500ml); CSF leak; Transient CN VII.	Blood loss: 10%; CSF leak: 2%; Recovered CN VII Palsy: 5%	Embolization mitigates blood loss and complications
Trâm NTQ, 2022 (Viet Nam)	16 cases of tympanomastoid surgery	Tinnitus; Transient HL	Tinnitus: 12%; HL: 19%	Good results, no serious complications; recommended follow-up ≥12 months for long-term assessment.

Comment:

- **The most common complications** are hearing loss (10–30%) and residual tinnitus, which are often transient.
- **Facial nerve palsy** is rare (<8%) and usually reversible.
- **CSF leak and infection** are uncommon (<3%), often occurring in extensive tumor or skull base surgery
- **Preoperative embolization** significantly reduces blood loss and shortens surgical time.
- Vietnamese studies confirm the **safety profile of endoscopic** techniques.

3.5. Diagnostic Imaging (CT & MRI)

Table 5. Imaging Characteristics

Author (Year, Country)	Modality	Typical Findings	Diagnostic Value / Advantages	Restrictions or notes
Carlson ML et al., 2015 (USA)	CT + MRI (Gadolinium)	CT: Soft tissue in mesotympanum. MRI: "Salt-and-pepper" sign. Marked Post-contrast Enhancement	CT defines the extent of bone invasion; MRI assesses soft tissue and extension to the skull base	CT is limited in soft tissue evaluation; MRI is needed to differentiate from other tumors (neuroma, cholesteatoma)
Zhong S et al., 2023 (China)	HRCT + MRI T1,T2, MRA	- HRCT: round lesion, clear boundary, can cause bone loss in the middle ear cavity - MRI: increased signal on T2, strong enhancement, can see blood flow	MRI and MRA help differentiate glomus jugulare from glomus jugulare; MRA aids in planning preoperative embolization	"Salt and pepper" sign is evident in tumors ≥ 1 cm; small tumors can be confused with chronic otitis media.
Jackson CG, 2019 (USA)	CT + MRI 3D recon	- CT: helps determine the limits of the mastoid bone and the posterior wall of the ear canal - MRI: determines the boundary between the tumor and the VII and IX nerves	3D CT-MRI combination allows detailed surgical mapping, limiting nerve damage	High cost; not routinely applicable to all minor cases
Trâm NTQ, 2022 (Viet Nam)	CT (0.6mm) + Skull Base MRI	- CT: increased density soft tissue mass, close to the tympanic membrane - MRI: strong enhancement, clear boundary with the labyrinth	Helps differentiate between Middle Ear Fibroma and Granular Mastoiditis	Otoscopy should be combined to determine the exact Glasscock–Jackson stage.
Lê Minh Đức, 2024 (Viet Nam)	mpMRI + MRI 3D	- MRI: strong signal increase after injection, no skull base invasion - CT: assessment of ossicles and tympanic wall	MRI helps identify early stage tumors (I–II) before laparoscopic surgery; CT helps guide the surgical path	In small tumors <5 mm, MRI may miss them if adequate contrast is not injected.

Comment:

- **CT Scan** is highly valuable in **determining the extent of osseous destruction** (bone erosion) and assessing the relationship of the tumor with the ossicular chain, the ear canal, and the skull base.
- **MRI** is particularly useful for **differentiating the mass from other lesions**, defining **soft tissue margins**, and **evaluating extension** beyond the middle ear.
- The characteristic MRI finding of a glomus tympanicum (ear drum paraganglioma) is the **"salt and pepper" sign** and **marked enhancement following gadolinium injection**.

- The **combination of CT and MRI** is the current diagnostic standard, which aids in safe surgical planning and minimizes complications.
- In Vietnam, the utilization of **high-resolution CT (HRCT) and multi-sequence MRI** has significantly increased the ability to detect early-stage (I–II) tumors.

4. CONCLUSION

Glomus tympanicum is a **benign, slow-growing vascular tumor** originating from the middle ear paraganglia. Despite its rarity, it is the most common tumor of the middle ear, predominantly affecting **middle-aged women** and presenting with **pulsatile tinnitus** and **conductive hearing loss**.

Advances in **diagnostic imaging (CT, MRI)** and **otoendoscopy** have facilitated early detection and improved prognoses. **Surgical resection** remains the primary treatment, particularly for Glasscock–Jackson stages I–III. Adjuvants such as **preoperative embolization** and **endoscopic ear surgery** significantly reduce complications and enhance recovery.

Postoperative complications, including transient hearing loss or facial weakness, are generally reversible. Recurrence rates are low following complete resection. In Vietnam, the shift towards **minimally invasive, endoscope-assisted surgery** has demonstrated safety and efficacy. Future **multicenter, long-term studies** are necessary to fully evaluate recurrence risks and long-term outcomes.

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