Role of Otoendoscopy in the Management of Glomus Tympanicum

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Abstract

Background. Glomus Tympanicum is the commonest middle ear neoplasm. Total removal through conservative middle-ear surgery is the gold standard of treatment. Variable surgical techniques have been reported with modifications.

Hypothesis. Using endoscopes improves diagnosis and surgical removal of glomus tympanicum.

Study design. Prospective case series.

Methods. Examination of ears with suspected glomus tumours was done by microscope and endoscope. CT scan was done to confirm the diagnosis and typing. Endoscopic assisted surgical excision was done; using the standard microscopic technique and adjunctively using 2.7 and 4mm 30º endoscopes, and angled fine instruments.

Results. Eleven patients (11 ears) with different types of glomus tympanicum were diagnosed and treated. Endoscopes were superior to microscopes to detect smaller lesions behind tympanic membrane. Complete removal could be accomplished without performing a wide canaloplasty or canal wall down technique in 10/11 (91%). No evidence for recurrence was noted in the follow up period.

Conclusion. Otoendoscopy aids diagnosis of glomus tumours at earlier stages, and ensures complete tumour removal from hidden areas and controlling the feeding vessel.

Key words: *glomus tymanicum, chemodect-oma, middle ear tumors otoendoscopy.*

Introduction

Glomus tympanicum [GT] tumors originate from the glomus chemoreceptor stations in the middle ear that course along the tympanic segment of Jacobson's (IX) nerve or along the auricular branch of Arnold's (X) nerve. There are glomus stations throughout the mesotympanum, including, rarely, the superior quadrants and epitympanum. By definition, GT does not involve the jugular bulb, although when large, may extend beyond the confines of the tympanum [1].

Surgical resection is still considered the primary treatment modality. Surgical approaches vary from transmeatal approach, extended facial recess approach, or canal wall down mastoidectomy depending on the type and extent of the tumor. Lasers have been also used to obtain a bloodless field [2]. Recently, a wide canaloplasty has been suggested as a modified approach to avoid a canal wall down [3]; however, this may carry increasing risk to the facial nerve.

Endoscopes' use has advanced management of nasal and sinus diseases. The main advantages are better illumination, visualization of hidden recesses, and ability to work with angled instruments under visual control. Since its introduction in otology, endoscopes proved helpful in diagnosing obscure ear diseases and during surgery [4]. So, otoendoscopy has been incorporated in the routine diagnosis and partly in otologic surgery in our institution. Consequently, it has been used in GT cases assuming that using endoscopes will improve diagnosis and surgical outcomes.

Patients and methods

The study was conducted in the Department of Otolaryngology, Ain Shams University Hospitals, from January 2000 to June 2006. Patients, presented complaining of unilateral ear symptoms suggestive of a glomus tumor, were included in the study. All patients underwent thorough history taking and physical examination. Ear examination was done by otoscopy, microscopy and otoendoscopy. Otoendoscopy was done using a Hopkins II, 2.7 mm diameter, 30º endoscope.

Computed tomography (CT) of the temporal bone with contrast, in axial and coronal planes, was done for all patients suspected to have a vascular cause of tinnitus. Magnetic resonance imaging (MRI) with arterial and venous studies (MRA & MRV), were done for selected patients. Angiography was done preoperatively for embolizing large tumors.

After obtaining an informed consent, surgical resection of tumors followed using endoscopic assisted-removal and examination intraoperatively for all patients. Standard otologic surgery instruments and techniques were used. When appropriate, 30º 2.7mm and 4mm Hopkins II telescopes and videocamera with angled ear instruments were used to perform surgical dissection and tumour removal.

Surgical approach commenced by a retroauricular incision, elevating tympanomeatal flap, entering the middle ear cautiously to avoid inadvertent injury to the tumor and bleeding. Comparison was always done between middle ear and tumor examination using the microscope and the endoscope.

Using the microscope, dissection of the tumor from ossicles and middle ear structures was done using blunt dissector and hooks. Endoscopes were then used to detect residual tumor tissues in facial recesses, epitympanum and hypotympanum. Any tumor tissue found was removed by angled dissectors and forceps under endoscopic control.

Intraoperative bleeding was controlled by warm saline irrigation, temporary packing with cottonoids. Identifying feeding vessels was always done and they were bipolar cauterized wherever judged to be safe. Surgicel and gelfoam packing were used after complete removal of the tumor to ensure haemostasis.

Results

Eleven patients (11 ears) with confirmed diagnosis of glomus tympanicum were included in the study. Table 1 summarizes patients' demographics and their presentations.

Table 1. Patients with glomus tympanicum.

Mean Age ± SD (range)	45.7 ± 7.3 (34-58 years)
Gender (Female/ Male)	7/4 (1.8)
Clinical Picture	
Laterality (Left/ Right)	6/5 (1.2)
Pulsating tinnitus	11 (100%)
Hearing loss	10 (90%)
Conductive	*7 (63%)*
Mixed	*3 (27%)*
Mass seen	11 (100%)
Behind TM	*9 (82%)*
Presenting in EAM	*2 (18%)*
GT type*	
I (limited to promontory)	4 (36%)
II (filling middle ear)	2 (18%)
III (extending to mastoid)	3 (27%)
IV (extending to EAM)	2 (18%)

SD: standard deviation; TM: tympanic membrane; EAM: external auditory meatus; GT: Glomus Tympanicum, * according to Glasscock-Jackson classification.

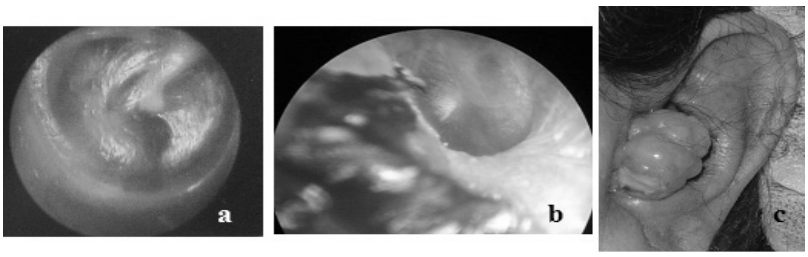

Figure 1. Clinical presentations of glomus tympanicum: a) type I, mass behind intact tympanic membrane; b) type I, tortuous external canal, mass behind tympanic membrane; c) type IV, mass extending outside left external auditory meatus.

Endoscopic examination aided to visualize a mass behind intact ear drum (Fig 1) in 9 patients, while 2 patients had glomus mass protruding into external canal.

None of the patients had facial palsy or general symptoms suggestive of a secreting chemodectoma and urine screening for catecholamines was negative in all patients. None of the patients gave history of familial chemodectomas.

CT scan (Fig. 2) was very helpful to identify lesions and extensions in all cases and their categorization into types according to Glasscock-Jackson classification [5], which was used in this study as it clearly separates between GT and jugulare tumors. CT, also, allowed differentiating these lesions from

glomus jugulare. Effectively, it also allowed exclusion of other vascular aberrations as high jugular bulb or aberrant carotid artery as a cause of pulsating tinnitus in some patients and they were excluded from this study (Fig.3).

Figure 2. CT scans, coronal cuts showing types of glomus tymanicum: a) type I, limited to promontory; b) type II, filling middle ear; c) type III, extending to mastoid air cells; d) type IV, filling middle ear mastoid and external auditory canal; however, jugular fossa is intact.

Figure 3. CT scans, axial cuts: a) glomus tympanicum, with intact jugular fossa; b) glomus juugulare with widened and destructed jugular foramen; c) dehiscent jugular bulb; d) aberrant carotid artery.

MRI was not helpful to identify lesion extensions; mastoid infiltration was underestimated by radiologists as mastoiditis. MRA and MRV also failed to detect vascular nature of tumors. Angiography was done to a patient with type IV GT; it showed that the main feeding vessel was the Ascending pharyngeal artery (Fig. 4). However, selective embolization failed, as the patient developed transient hemiparesis, which could be explained by possible communication through a feeder from carotico-tympanic artery arising from internal carotid artery.

Figure 4. Radiologic evaluation of glomus tympanicum type IV: a) MRI showing extensive tumor, MRI signal of mastoid lesion differed from the mass in middle ear and external canal, which caused underestimation by radiologists; b) normal MRA; c) Angiography showing ascending pharyngeal artery as the main feeding vessel.

Intraoperative comparisons between endoscopic and microscopic views were done (Fig 5). Endoscopes were always superior as they allowed visualization of tumour extensions and allowed removal of any glomus tissues hidden in sinus tympani or hypotympanum without the need of canal drilling.

Figure 5. Intraopertive views: a) microscopic assessment of glomus tumour; b) endoscopic view of same tumour clarifying clear sinus tympani; c) microscopic assessment of total tumour excision; d) endoscopic evidence of tumour remnants in hypotympanum and its removal.

Complete excision of tumor was possible using tympanotomy approach in 6 patients (55%), those patients had type I or II GT. A canal wall-up mastoidectomy was also needed in 4 patients (36%), those with type III and IV GT, to remove tumor tissue that extended into mastoid air cells. Still, using endoscopes helped to detect tumor in facial recess and drilling the facial recess was not needed, which helped to lessen possibility of facial nerve injury. Only one patient (9%) with a huge tumor (type IV) required a canal wall down technique to completely excise the tumor, endoscopes were of limited value in that patient because of cumbersome bleeding as embolization failed preoperatively.

No complications related to surgery were noted in any of the patients. Hearing and facial nerve functions were conserved postoperatively in all patients. Follow up for periods ranging from 6-36 months did not reveal recurrence of disease.

Discussion

Glomus tympanicum is a chemodectoma that arise from neuroectodermal tissues. Glomus tumours represent the most common primary neoplasms of the middle ear. Still, it is a rare tumor, Mayo clinic series [6] included only 13 GT out of 236 patients with chemodectomas (5.5%) over a period of 20 years. The same group of patients had 69% of their paragnagliomas in the head and neck region. Different classifications are used in the literature to categorize glomus tumours. The present study adopted Glasscock-Jackson

classification because it clearly separates glomus tympanicum from glomus jugulare tumours.

The present study included a series of 11 patients over 6 years, with different types of GT; types I-II presented 55% and types III-IV 45%. Female patients almost doubled males, all were in the 4^{th} to 6^{th} decade of age and there was no difference in the side of lesions.

Total removal through conservative middle-ear surgery is still considered as the gold standard of the treatment. Advances in the field of imaging and technical refinements in traditional surgery have made correct diagnosis and complete excision of these tumours possible in most of the cases. However, the literature has sporadically suggested radiation as the primary therapy (alone/pre-operatively) [2].

Otoendoscopy has been incorporated in otologic procedures in our institution. The advantages of otoendoscopy include visualization of the whole ear canal without having to manipulate the microscope or the patient's head, giving access to portions of ear drum and to structures hidden by bony humps and visualization from different angles as opposed to the single axis offered by microscopic examination [4].

This encouraged the use of endoscopes in managing GT. In the present study, endoscopes were helpful to diagnose lesions earlier; tumour was clearly visualized behind intact tympanic membrane even with a tortuous external auditory canal. It also, provided a permanent document of the lesion.

Surgery was done incorporating endoscopic-assisted removal which was feasible in 91% of cases. Advantageously, it decreased the need of bony canal drilling as it aided the visualization of tumours and enabled removing residual tissues after microscopic extirpation without endangering important structures. Also, it helped to identify the feeding vessels and its precise control using bipolar cautery.

However, endoscopes may be cumbersome during severe bleeding, where 2 hands are needed to control bleeding; at such instances surgeon may shift to microscopic work. However, it is possible to work with 2 hands under endoscopic visualization, by either using an endoscope holder or by the help of a skilled assistant. As well, there are no angled instruments have been developed for advanced endoscopic otologic procedures.

There are scarce publications about the use of endoscopes in managing glomus tumours. Researchers reported that using angled endoscopes helped removing 2 glomus jugulare tumours at the apical carotid artery region without the need of facial nerve rerouting [7]. Also, there is an interesting case report of successful resection of a recurrent glomus jugulare tumour at the jugular foramen using transnasal endoscopic approach [8].

Conclusion

Otoendoscopy proves to be valuable for early diagnosis of glomus tymapnicum, and hence management of smaller lesions. It may be incorporated in surgery, as it helps complete excision while minimizing bony drilling, especially if tumour extends into recesses.

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