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Short Communication

Translabyrinthine approach to internal auditory meatus: A retrospective study

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ABSTRACT

Background: Ear and the lateral skull base surgery is challenging and yet fascinating for a Neuro-otologist. A thorough knowledge of the complex anatomy is indispensable for the surgeon in order to provide the best possible care.

Methods: The aim of the study was to highlight the present day indications for translabyrinthine approach to IAM from a Neuro-otologist perspective.

Results: There were a total of 7 patients who underwent Translabyrinthine approach at our centre. In the present study we have reported cases of Vestibular Schwannoma, Facial nerve schwannoma, Cholesteatoma involving the IAM, Meniere's disease with refractory vertigo which were managed via translabyrinthine approach. We also encountered, probably the first reported case, tuberculoma of the IAM which was clinical suspected to be vestibular schwannoma.

Conclusion: The article presents different clinical situations where this approach can be suitably utilized and has been dealt with via a retrospective study encountered at our centre.

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Introduction

Ear and the lateral skull base surgery is challenging and yet fascinating for a neuro-otologist. A thorough knowledge of the complex anatomy is indispensable for the surgeon in order to provide the best possible care to his patients and also to improve his surgical skills. Lateral skull base approaches can be broadly classified into: (1) those through the otic capsule, (2) those conserving the otic capsule and (3) a combination of the two.

The translabyrinthine approach, through otic capsule, offers an excellent anatomical view and direct approach of the cerebellopontine angle (CPA) and internal auditory meatus (IAM) with functional preservation of the facial nerve and minimal morbidity.¹

In the past two and half years, we have operated on cases of vestibular schwannoma, facial nerve schwannoma, Meniere's disease with refractory vertigo via translabyrinthine approach. Apart from this, we encountered a rare case of tuberculoma of the IAM. The aim of the study was to highlight the present day indications for translabyrinthine approach to IAM from a

neuro-otologist perspective. Additionally, it addresses the traditional labyrinthectomy and identifies a time-efficient version.

Material and Methods

Our study was a retrospective study, conducted at a tertiary care centre in southern India, and comprised of cohort of 7 patients who underwent translabyrinthine approach from January 2012 to June 2015. Institutional research ethics board approval was obtained. Records were obtained from our medical records department. All relevant history, clinical examination, investigations, and surgical finding were noted.

Results

There were a total of 7 patients who underwent translabyrinthine approach at our centre. The clinical details are as listed in Table 1. At the stage of clinical diagnosis there were total of 4 cases of vestibular schwannoma; 1 case of facial nerve

Table 1 – Clinical details of cases: translabyrinthine approach to Internal auditory meatus.

Serial no.	Age (years)/sex	Presenting complaints	Clinical findings	Audiology	Imaging (HRCT temporal bone ± MRI of CPA)	Clinical diagnosis
1	41 years/female	Progressive hearing loss left side	SNHL on left side	Left profound SNHL	HRCT: widening of IAC on left side; MRI: hypointense on T1W and isointense of T2W, enhancing lesion	Vestibular schwannoma (left)
2	25 years/male	Progressive hearing loss and facial asymmetry left side	SNHL on left side facial paresis (HB Grade III) on left side	Left severe SNHL	HRCT: multisegment soft tissue mass involving perigeniculate area, vertical segment of facial nerve and fundus of IAM with erosion of vestibule on left side. Normal cochlea; MRI: heterogenous enhancing lobulated mass lesion [Fig. 1]	Facial nerve schwannoma (left)
3	39 years/male	Progressive hearing loss right side	SNHL on right side	Right profound SNHL	HRCT: widening of IAC on right side; MRI: hypointense on T1W and isointense of T2W, enhancing lesion	Vestibular schwannoma (right)
4	35 years/male	Progressive hearing loss left side	SNHL on left side	Left profound SNHL	Normal scan	Meniere's disease with intractable vertigo (left)
5	13 years/female	Hearing loss × 1 year and progressive facial asymmetry left side × 6 months	SNHL on left side facial paresis (HB Grade IV) on left side	Left profound SNHL	HRCT: narrow left IAM (<2 mm), normal inner ear; MRI: hypoplastic left vestibule-cochlear nerve [Fig. 2]	IAM stenosis with profound SNHL and facial paresis (left)
6	46 years/female	Progressive hearing loss right side	SNHL on right side	Right profound SNHL	HRCT: widening of IAM on right side; MRI: hypointense on T1W and isointense of T2W, enhancing lesion	Vestibular schwannoma (right)
7	45 years/male	Progressive hearing loss and facial paresis left side	SNHL on left side; facial paresis (HB Grade IV) on left side	Left profound SNHL	HRCT: widening of IAM on left side; MRI: hypointense on T1W and T2W, enhancing lesion [Fig. 3]	Vestibular schwannoma (left)

Fig. 1 – Facial nerve schwannoma. (A) HRCT temporal bone coronal section showing multisegment soft tissue mass involving the vertical segment of facial nerve and erosion into the vestibule. (B): T2W1 MRI-Axial section, showing hyperintense lobulated mass lesion involving left vestibule.

Fig. 2 – IAM stenosis. (A and B) HRCT temporal bone axial sections showing normal IAM diameter on right side and narrow IAM (<2 mm) on left side with normal inner ear. (C and D) MRI of CPA showing normal cochleovestibular bundle on right side and hypoplastic cochleovestibular bundle on left side.

schwannoma (Fig. 1); 1 case of IAM stenosis with facial nerve paresis (Fig. 2); and lastly there was 1 case of Meniere's disease with intractable vertigo (non controlled with medical management and intra tympanic injection of gentamicin as listed in Table 1).

All these cases were having severe to profound sensorineural hearing loss (SNHL) on the affected side. Patients and their family members were counselled about the disease and the relevant treatment options and complications and

prognosis. Informed consent was obtained from all the patients.

Surgery was performed via standard translabyrinthine approach. The surgical details are listed in Table 2. To prevent any cerebrospinal fluid leak, we sealed the surgical defect and mastoid cavity in all our cases with autologous fascia lata, fat and tissue glue.

There was one case of a 35-year-old male diagnosed as Meniere's disease with profound SNHL (left ear) and intractable

Table 2 – Surgical details of cases undergoing translabyrinthine approach.

Serial no.	Surgery and surgical findings	Final diagnosis after histopathological report	Post-operative period and follow-up
1	Left mastoidectomy with labyrinthectomy and removal of tumour from IAM and CPA with preservation of facial nerve	Vestibular schwannoma (left)	Uneventful; no evidence of recurrence
2	Left mastoidectomy and posterior tympanotomy with labyrinthectomy + facial nerve decompression from IAM to stylomastoid foramen.	Facial nerve schwannoma (left)	Uneventful; facial nerve function improved to Grade II (HB) on left side
3	Right mastoidectomy with labyrinthectomy and removal of tumour from IAM and CPA with preservation of facial nerve	Vestibular schwannoma (right)	Uneventful; no evidence of recurrence
4	Left mastoidectomy with labyrinthectomy and selective vestibular nerve section	Meniere's disease with intractable vertigo (left)	Uneventful; vertigo controlled
5	Left mastoidectomy and posterior tympanotomy with labyrinthectomy and exposure of IAM + facial nerve decompression	IAM stenosis with facial paresis (left)	Uneventful; facial nerve function improved to Grade II (HB) on left side
6	Right mastoidectomy with labyrinthectomy and removal of tumour from IAM and CPA with preservation of facial nerve	Vestibular schwannoma (right)	CSF collection; revision surgery done to seal the leak
7	Left mastoidectomy with labyrinthectomy and removal of tumour from IAM with preservation of facial nerve. Pale granulation visualised around the vestibular nerve with adhesion to surrounding nerves in IAM	HPE: caseating granuloma; tuberculoma of IAM (left) [Fig. 3]	HRCT chest: old pulmonary Koch's; TB Quantiferon test strongly positive; serum analysis for other granulomatous disease negative

vertigo, who did not respond to medical management and intra-tympanic injection of Gentamicin. The patient was advised and counselled about selective vestibular nerve section on left side, which is standard of care in such cases, either via translabyrinthine approach or retrosigmoid approach. The patient wanted to get operated by the primary treating surgeon and opted for left trans labyrinthine selective vestibular nerve

section. Post-operative period was uneventful with complete control of his vertigo.

Another interesting case was that of a 13-year-old girl, who presented with history of hearing loss in left ear noticed for the past 1 year and progressive facial asymmetry on the left side of 6 months duration. There was no history of vertigo or trauma. On imaging, it was found that she had a narrow IAM (<2 mm)

Fig. 3 – Tuberculoma of IAM. (A) MRI (axial, T2W1, axial, coronal, post contrast images) shows hyperintense (T2W1) lesion in left IAM with post contrast enhancement. (B and C) HPE showed caseating granuloma suggestive of tuberculoma of the IAM.

with a hypoplastic cochlea vestibular nerve. There were no associated bony lesions like osteoma or Paget's disease. As she had severe SNHL with facial asymmetry (HB Gr IV), which was progressive in nature, we planned for facial nerve decompression via translabyrinthine approach. Post-operative period was uneventful with partial recovery in her facial nerve function (HB Gr II).

It was surprising to find that the last patient, whom we diagnosed preoperatively as vestibular schwannoma of left IAM, was given a diagnosis of caseating granuloma on histopathological report suggestive of tuberculoma (Fig. 3). Intraoperatively, we had noticed pale granulations with adhesions unlike a vestibular schwannoma. On further investigation, we found evidence of old pulmonary Koch's on high-resolution computed tomography (HRCT) of the chest, and gold quantiferon test was strongly positive for the patient. Serum analysis for other granulomatous disease was negative. The final diagnosis for the patient was Tuberculoma of the IAM, and the patient was started on antitubercular treatment (ATT) after consultation with the pulmonologist. Patient has completed his course of ATT and is on regular follow up for the past 1 year and is doing well. So finally we had 3 cases of vestibular schwannoma and 1 case of tuberculoma of the IAM out of the initial four clinical diagnosed cases of vestibular schwannoma.

Out of the 7 patients, only one patient had a significant cerebrospinal fluid (CSF) leak and collection which did not respond with conservative management. In this case, we had to re-explore the surgical site and after identification of the leak we sealed it again with temporalis fascia, fat and tissue glue. After which patient did not have any further CSF leak.

Discussion

The labyrinthine bone in humans is the densest or the hardest bone while its membranous portion is like a network of complex path.² Hence, the term labyrinth to this part of temporal bone symbolising a hard path or a maze.

The translabyrinthine approach was first described by Panse in 1904. Later in 1912, Quix used this approach to resect a tumour involving the IAM and CPA. However, it was not until 1964, when House published 47 resections with no mortalities the approach was truly popularised.³

Surgical series of translabyrinthine approach often includes IAM and CPA tumours including vestibular schwannoma, other cranial nerve schwannoma, meningioma, cholesteatoma, neuromas, epidermoids, glomus tumours, choroid plexus papillomas and chordomas.^{1,3} In the present study, we have reported cases of vestibular schwannoma, facial nerve schwannoma, and Meniere's disease with refractory vertigo which were managed via translabyrinthine approach. We also encountered, probably the first reported case, tuberculoma of the IAM which was clinically suspected to be vestibular schwannoma.

Vestibular schwannomas are operated via one of the three main surgical approaches: the retrosigmoid, the translabyrinthine, or the middle fossa approaches.^{1,4,5} In contemporary surgical management of vestibular schwannomas, the choice of the surgical approach depends on the size and location of

the tumour, the quality of preoperative hearing, and the desire for attempts at hearing preservation.⁶ The translabyrinthine approach provides excellent and the most direct access to the IAM and CPA.^{1,6} It is indicated in patients with poor preoperative hearing and for patients with large tumours who have a low probability of hearing preservation.^{1,6} Moreover tumours larger than 2.5 cm and deep involvement of the fundus tend to have poor likelihood of hearing preservation regardless of the approach.⁷ Hence, translabyrinthine approach is recommended in cases in which the tumour is larger than 2.5 cm and hearing has progressed to a nonserviceable level.¹

In our cohort of patients, all of them had unserviceable hearing and hence, the choice of translabyrinthine approach. The added advantages of the approach to the neuro-otologist include: (1) the tumour size is not a limiting factor; (2) it allows early identification of facial nerve in the IAM and its preservation; (3) cerebellar retraction is not required and (4) lastly the otologist is more familiar with the surgical anatomy via this approach.^{1,6} We were able to preserve the facial nerve function in all our patients. In fact there was partial recovery of facial nerve function in all the affected patients.

Although facial nerve schwannomas are the most common primary neoplastic lesion of the facial nerve, they are relatively uncommon tumours of the temporal bone.^{8,9} The lesions are typically multisegmental and can involve the facial nerve anywhere along its course; however, the sites of predilection include the peri-geniculate area, the tympanic segment and the mastoid segment.⁸⁻¹⁰ The common presenting complaints of facial paresis and hearing loss and a gamut of other reported symptoms are nonspecific in nature.^{8,9} Clinical suspicion is raised when a patient presents with remitting and relapsing facial paresis.⁹ In the present study, the patient was a 25-year-old young male, who presented with non-specific symptoms of progressive hearing loss and facial paresis on left side.

Contrast enhanced magnetic resonance imaging (MRI) study along with computed tomography (CT) scan facilitates increased diagnostic certainty, by differentiating it from lesions like facial nerve hemangioma, and also accurate characterisation in multisegment lesions.^{8,9,11} However, imaging (CT and MRI) was diagnostic showing multisegment involvement of the facial nerve including the fundus of the IAM, peri-geniculate area and the mastoid segment.

Treatment option includes: (1) observation; (2) bony decompression; (3) bony decompression and partial tumour resection; (4) resection and grafting of facial nerve and (5) stereotactic radiation.^{8,9} Nowadays, neuro-otologists adopt a conservative approach in the treatment of facial nerve schwannoma, as it is driven by the desire to preserve facial function for the longest period of time and at the best possible level.⁸ The other factors considered are tumour growth, age of patient, concerns for adjacent structures and compressive symptoms and radiation failure.^{8,9} In the present case, because the tumour was confined within the temporal bone with progressive facial nerve paresis and unserviceable hearing, facial nerve decompression was attempted from IAM to stylomastoid segment via translabyrinthine approach with satisfactory outcomes.

Meniere's disease is a clinical diagnosis as no tests are diagnostic. Since, the presence of endolymphatic hydrops can

be proved with certainty only by postmortem histological examination of the temporal bones.¹² The goal of treatment is to control vertigo initially with medical management. Cases refractory to medical management require surgical interventions either non-ablative (e.g. Meniette's device, intratympanic steroid injections, endolymphatic sac surgery) or ablative (chemical or surgical labyrinthectomy).^{13,14} The ablative surgeries are limited to those who have refractory vertigo even after non-ablative interventions.^{14,15} However, the gold standard surgical intervention continues to be vestibular nerve section either with labyrinthectomy or without labyrinthectomy.^{13–15} Our patient was a clinically diagnosed case of left sided Meniere's disease with unserviceable hearing and intractable vertigo even after intratympanic injection of gentamicin. In view of the refractory nature of his vertigo, patient was advised to undergo vestibular nerve section either via a translabyrinthine approach or a retrosigmoid approach. The patient wanted to get operated by the primary treating surgeon and opted for translabyrinthine approach to selective vestibular nerve section. Post-operatively, the patient is comfortable with control of his vertigo.

Unilateral or bilateral stenosis of the IAM is rare diagnosis and can present with hearing loss, facial paresis, dizziness and tinnitus.¹⁶ In the present study, the patient was a case of unilateral IAM stenosis who presented with hearing loss of 1 year duration with progressive facial asymmetry of 6 months duration on left side. HRCT of temporal bone is the diagnosis. By convention, IAM diameter less than 2 mm or loss of 3 mm or more of vertical diameter of the IAM is considered as stenosis.¹⁶ Imaging in present case showed vestibulocochlear nerve hypoplasia with narrowing of IAM (less than 2 mm) on the affected side. IAM stenosis may occur primarily without any associated abnormalities (congenital) or it may be secondary to osseous lesions such as osteoma, exostosis, otosclerosis, fibrous dysplasia, Paget's disease or osteopetrosis.^{16–20} The present case underwent a translabyrinthine approach to IAM with decompression of facial nerve because of the progressive nature of facial nerve paresis. Surgery is indicated when IAM stenosis is associated with symptoms such as hearing loss and facial asymmetry.¹⁷ It is interesting to note that in the present case of IAM stenosis although the patient had progressive facial paresis no associated secondary osseous lesions on radiological investigation to explain the progression of palsy was found. In our opinion, it is likely to be a case of congenital IAM stenosis with secondary inflammation, compression, ischaemia leading to progressive facial palsy. Nakamura et al.²¹ reported a case of congenital IAM stenosis in a 37-year-old lady with long standing SNHL with acute onset vertigo and ipsilateral facial palsy. No generalised skeletal disease or bony tumours was evident.

In endemic countries such as India, 20% of intracranial space occupying lesions have a tuberculous origin, while tuberculoma comprises 10–30% of central nervous system tuberculosis.²² Tuberculoma has been reported in rare locations such as cavernous sinus, hypothalamic region, Meckel's cave, sellar and suprasellar regions and CPA and are challenging pathology as they can mimic brain tumours.^{22–27} Our patient was a case of tuberculoma of the IAM, which was

mimicking as vestibular schwannoma because of its location. First line treatment is ATT (4 drugs for at least 12 months) and adjuvant steroids. In inconclusive cases, surgical biopsy is recommended for histopathological confirmation and to reduce mass effect and to be always followed by ATT and adjuvant steroids.²² In our reported case, after an unsuspected diagnosis of tuberculoma of IAM on histopathological examination, it was additionally confirmed with HRCT of the chest and gold quantiferon test, and investigations were done to rule out other granulomatous disease. This is also probably the first reported case of tuberculoma involving the cochleovestibular nerve in the IAM.

Conclusion

The article presents different clinical situations where this approach can be suitably utilised has been dealt with via a series of cases encountered at our centre. The article presents a comprehensive review of the translabyrinthine approach to IAM from the perspective of a neuro-otologist. However, the treatment and approach have to be individualised and stringent selection criteria in deciding on the appropriate surgical management is crucial.

Conflicts of interest

The authors have none to declare.

REFERENCES

1. Arriaga MA, Lin J. Translabyrinthine approach: indications, techniques, and results. *Otolaryngol Clin N Am.* 2012;45(April (2)):399–415.
2. Rask-Andersen H, Liu W, Erixon E, et al. Human cochlea: anatomical characteristics and their relevance for cochlear implantation. *Anat Rec.* 2012;295:1791–1811.
3. Nickele CM, Akture E, Gubbels SP, Baskaya MK. A stepwise illustration of the translabyrinthine approach to a large cystic vestibular schwannoma. *Neurosurg Focus.* 2012;33 (September (3)):E11.
4. Elhammady MS, Telischi FF, Morcos JJ. Retrosigmoid approach: indications, techniques, and results. *Otolaryngol Clin N Am.* 2012;45(2):375–397.
5. Angeli S. Middle fossa approach: indications, technique, and results. *Otolaryngol Clin N Am.* 2012;45(2):417–438.
6. Chamoun R, MacDonald J, Shelton C, Couldwell WT. Surgical approaches for resection of vestibular schwannomas: translabyrinthine, retrosigmoid, and middle fossa approaches. *Neurosurg Focus.* 2012;33(3):E9.
7. Yates PD, Jackler RK, Satar B, et al. Is it worthwhile to attempt hearing preservation in larger acoustic neuromas? *Otol Neurotol.* 2003;24(3):460–464.
8. Wilkinson EP, Hoa M, Slattery WH, et al. Evolution in the management of facial nerve schwannoma. *Laryngoscope.* 2011;121:2065–2074.
9. Thompson AL, Aviv RI, Chen JM, et al. Magnetic resonance imaging of facial nerve schwannoma. *Laryngoscope.* 2009;119:2428–2436.
10. O'Donoghue GM, Brackmann DE, House JW, Jackler RK. Neuromas of the facial nerve. *Am J Otol.* 1989;10:49–54.

11. Wiggins III RH, Harnsberger HR, Salzman KL, Shelton C, Kertesz TR, Glastonbury CM. The many faces of facial nerve schwannoma. *Am J Neuroradiol.* 2006;27:694–699.
12. Lopez-Escamez JA, Carey J, Chung WH, et al. Diagnostic criteria for Meniere's disease. *J Vestib Res.* 2015;25:1–7.
13. Brandt T, Dieterich M, Strupp M. *Vertigo and Dizziness Common Complaints.* 2nd ed. London: Springer-Verlag; 2013.
14. Ghossaini SN, Wazen JJ. An update on the surgical treatment of Meniere's diseases. *J Am Acad Audiol.* 2006;17:38–44.
15. Rah YC, Han JJ, Park J, Choi BY, Koo J. Management of intractable Meniere's disease after intratympanic injection of gentamicin. *Laryngoscope.* 2015;125:972–978.
16. Baek SK, Chae SW, Jung HH. Congenital internal auditory canal stenosis. *J Laryngol Otol.* 2003;117(10):784–787.
17. Giorba A, Aimoni C, Bianchini C, Borrelli M, Calzolari F, Martini A. Bilateral osseous stenosis of the internal auditory canal: case report. *Acta Otorhinolaryngol Ital.* 2011;31(3):177–180.
18. Saha S, Pal S, Chowdhury K, Mondol A. Hearing outcomes after surgical intervention in fibrous dysplasia of temporal bone. *Indian J Otol.* 2012;8(4):217–219.
19. Monsell EM. The mechanism of hearing loss in Paget's disease of bone. *Laryngoscope.* 2004;114:598–606.
20. Dozier TS, Duncan IM, Klein AJ, Lambert PR, Key Jr LL. Otologic manifestations of malignant osteopetrosis. *Otol Neurotol.* 2005;26(4):762–766.
21. Nakamura K, Koda J, Koike Y. Stenosis of the internal auditory canal with VIIth and VIIIth cranial nerve dysfunctions. *ORL J Otorhinolaryngol Relat Spec.* 1999;61 (January–February (1)):16–18.
22. Jaimovich SG, Thea VC, Guevara M, Gardella JL. Cavernous sinus tuberculoma mimicking a neoplasm: case report, literature review, and diagnostic and treatment suggestions for tuberculomas in rare locations. *Surg Neurol Int.* 2013;4:158.
23. Flannery MT, Pattani S, Wallach PM, Warner E. Hypothalamic tuberculoma associated with secondary panhypopituitarism: case report. *Am J Med Sci.* 1993;306:101–103.
24. Goel A, Nadkarni T, Desai AP. Tuberculoma in the Meckel's cave: a case report. *Neurol India.* 1999;47:238–240.
25. Sharma MC, Arora R, Mahapatra AK, Sarat-Chandra P, Gaikwad SB, Sarkar C. Intracellar tuberculoma – an enigmatic pituitary infection: a series of 18 cases. *Clin Neurol Neurosurg.* 2000;102:72–77.
26. Jain R, Kumar R. Suprasellar tuberculoma presenting with diabetes insipidus and hypothyroidism – a case report. *Neurol India.* 2001;49(3):314–316.
27. Povedano Rodriguez V, Mellado Rubio R, Jurado Ramos A, Secco Pinero I, Lopez Villar P. Tuberculoma as expansive process of the cerebellopontine angle. Case report and bibliographical survey. *An Otorrinolaringol Ibero Am.* 1993;20:55–60.