

Hemangioma of Internal Auditory Canal: Systemic Review

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Abstract

Objective: The objective of this study was to present a review article about internal auditory canal hemangioma.

Data Sources: Published English-language literatures.

Review Methods: PubMed and Google scholars were systematically searched using multiple search terms.

Study Selection: We included studies about internal auditory canal hemangioma.

Results: 42 studies were included in this study. The results showed that most patients were male, the age of patients varied between 5 to 69 years old. Two cases were multiple familial hemangioma, while the most other cases were sporadic. Hearing loss was the most common symptoms, 37% patients had facial palsy, and 38% patients had vestibular symptoms. Since most patients had non- serviceable hearing loss so, translabyrinthine approach was the most common surgical approach. Most serviceable hearing patients lost their serviceable hearing after surgery. Only one third of patients with facial palsy had improvement after surgery. Most cases had attachment to facial nerve and can be removed totally.

Conclusion: we should suspect IAC hemangioma in any patient with considerable hearing loss and facial palsy with small lesion in internal auditory canal.

Keywords: IAC: Internal Auditory Canal; Cavernous hemangioma; Facial spasm; Translabrynthin

Abbreviations: TL: Translabrynthine; RS: Retrosigmoid; MFA: Middle Fossa Approach; IAC: Internal Auditory Canal; TR: Total Removal; NTR: Near Total Removal; HL: Hearing Loss; FP: Facial Palsy

Introduction

Cavernous hemangioma of the internal auditory canal (IAC) is a rare disease. It comprises 10 to 20% of all central nervous vascular malformations. They are composed of large, sinusoidal, thin-walled capillary spaces that may invade the surrounding neural tissue. They can mimic the symptoms of vestibular shwannomas. We review the clinical features and the management of the IAC hemangioma [1].

Material and Methods

Literature review was conducted using PubMed (MEDLINE) and Google Scholar for English articles, the following keywords were used: internal; auditory; canal and hemangioma.

Inclusion Criteria

All internal auditory canal hemangioma articles published after 1975 were included in the study.

Results

Fourty- four studies about IAC hemangioma have been reported in PubMed (MEDLINE) and Google scholars in English literatures (Table 1).

Table 1: IAC Hemangioma report cases.

Article.	Age sex	symptoms	Surgical approach	Intraoperative Finding nerve attachment	Removal Jextension CPA	Post-operative Hearing profile	Postoerative Facial palsy
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Sundarsean et al. [1]	23 M	Progressive profound HL Progressive FP	RS	CN VIII	TR No	Same	FP improve
	50 M	Progressive profound HL Progressive FP	RS	CN VII	TR No	Same	FP improve
Mangham et al. [2]	29 M	Progressive profound HL	TL	CN VII Facial- Facial anastomosis	TR No	Deaf (worse)	Facial palsy
	45 F	Tinnitus Facial palsy Normal serviceable hearing	MFA	CN VII Facial- facial anastomosis	NTR No	Deaf (worse)	Same facial palsy
	49 M	Vertigo Progressive severe Hearing loss	TL		No	Deaf Vertigo disappeared	normal
	44 M	Progressive profound HL	TL	CN VII	No	deaf	normal
	36 M	Unsteadiness Facial spasm Normal serviceable hearing	MFA		No	Unchanged Unsteadiness improved	No facial spasm Normal
	32 F	Progressive profound HI Facial spasm unsteadiness	TL		No	deaf	No facial spasm Normal facial
	31 M	Serviceable moderate HL Facial spasm Facial weakness	MFA	CNV II Facial- Facial anastomosis	No	THL worse	Worse fp Facial spasm improve
Pappas et al. [3]	26 M	Progressive profound HL SRT 40 dB PB 48 Tinnitus	TL	CN VII	NTR No	deaf	Delayed total FP .recovered
	31 F	Progressive moderate HL PTA 72 PB 0 Tinnitus unsteadiness Progressive FP	TL	CN VII	NTR Yes	deaf Unsteadiness improve	FP Unchanged
	29 M	Progressive profound HL SRT30 PB 96 serviceable unsteady	TL	CN VII Facial - Facial anastomosis	TR Yes	THL Unsteadiness improved	FP improved

	39 M	Progressive profound HL SRT 40 PB 24 Unsteady tinnitus	TL	CN VII	No	THL Unsteadiness improved	Normal
	56 M	Progressive profound HL SRT 70 PB 12 Tinnitus unsteady	TL	CN VII	NTR No	THL Unsteady improved	Postoperative FP improved
	44 M	Progressive sever HL deaf Tinnitus	TL	CN VII	NTR No	THL	Postoperative FP improved
	66 F	Acute profound HL unsteady deaf acute FP	TL	CN VII	No	THL Unsteadiness improved	IMPROVED
Madden et al. [4]	36 F	Progressive profound HL Progressive FP Facial spasm	TL	CN VII Facial - Facial anastomosis	TR No	THL	Same facial nerve Improved Facial spasm
Bordi et al. [5]	29 M	Progressive moderate HL PTA 60	RS	CN VII Facial- Facial anastomosis	TR No	Deaf	Facial palsy
Jacobson et al. [6]	41 F	Imbalance Normal hearing	MFA	CN VII	TR No	Normal	Normal
Cremers et al. [7]	39 M	progressive profound HL Tinnitus Recurrent FP	TL	CN VII	TR No	THL	Worse facial palsy
Fujino et al. [8]	58 M	Progressive mild to moderate serviceable HL Tinnitus Vertigo	RS	Attached CN III	TR No	Hearing worse Vertigo improved	Mild Facial palsy
Babu et al. [9]	36 M	Progressive severe HL PB 20 Vertigo	RS	CN VII	TR No	Improved	Normal
Saleh et al. [10]	44 M	Progressive severe HL PTA 70 Progressive FP	TL	CN VII	TR No	Deaf	Facial palsy worse
Kohn et al. [11]	44 M	Progressive profound HL Tinnitus Progressive FP	TL	CN VII NTR	STR No	Deaf	Same

Greiner - Perth et al. [12]	32 M	Dizziness Tinnitus MILD TO MODERATE Sudden HL serviceable	RS	Attached CN VII CN VIII	TR No	Hearing improved Vertigo improved	Normal
Fukuda et al. [13]	34 M	Vertigo MILD TO MODERATE Progressive serviceable HL	MFA	CN VII	TR No	Same Vertigo improved	Normal
Gjuric et al. [14]	43 F	Mild to moderate HL serviceable Tinnitus	MFA	CN VIII	TR No	Same	Normal
Sasaki et al. [15]	39 F	Mild progressive HL serviceable Tinnitus	RS	CN VIII CN VII	NTR No	Same preserve	Post-operative Facial palsy improved
Ommjola et al. [16]	45 M	Rapidly progressive profound HL Progressive FP Facial spasm Tinnitus	TL	CN VII	TR No	Deaf	Increase facial palsy Facial spasm improved
Roche et al. [17]	34 F	Progressive profound HL	TL	CN VII	TR No	Deaf	Postoperative FP
	62 F	Tinnitus Progressive profound HL	TL	CN VII Hypoglossal - Facial anastomosis	TR Yes	Deaf	Postoperative F
	23 F	Progressive severe HL Sudden FP	RS	CN VII CN VIII	TR	Deaf	Improved FP
Sami et al. [18] 2 cases Have extension on CPA	28 M	Progressive profound HL Tinnitus	RS	CN VIII	TR	Deaf	Facial palsy worse
	29 M	Progressive moderate HL serviceable Tinnitus \	RS	CN VIII	TR	Deaf	Facial palsy worse
	40 M	Progressive profound HL Facial spasm	RS	CN VIII	TR	Deaf	Normal facial Facial Spam improved
	42 M	Progressive moderate HL serviceable Tinnitus	RS	CN VIII	TR	Deaf	Same
	53 M	Progressive profound HL Progressive FP	RS	CN VII CN VIII Hypoglossal- Facial anastomosis	TR	Deaf	Same
	53 F	Progressive severe HL Tinnitus Facial spasm	RS	CN VII CN VIII Hypoglossal- Facial anastomosis	TR	Deaf	Facial palsy worse Spam improved

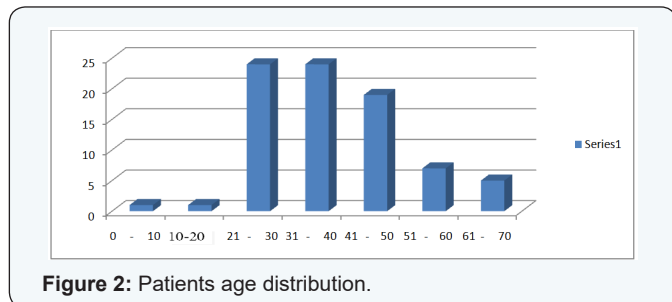
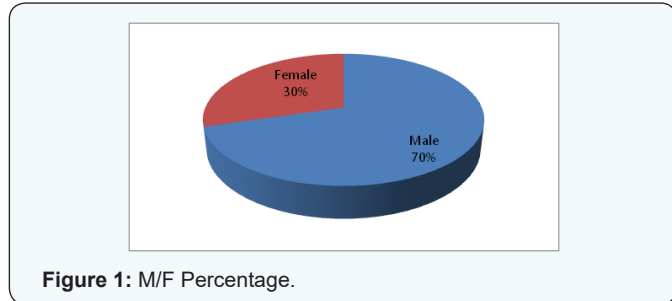
Lenarz et al. [19]	51 M	Progressive severe HL deaf Progressive F P Tinnitus unsteadiness	TL	CN VIII CN VII Facial - Facial anastomosis	TR No	Deaf	Same FP
Safaronova et al. [20]	40 M	Progressive profound HL Recurrent FP	RS	CN VIII CN VII	TR No	Dead	FP improved
Barrera et al. [21]	21 M	progressive profound HL Tinnitus	TL	CN VIII	TR No	THL	Facial palsy
Aquilina et al. [22]	29 F	progressive profound HL Progressive Facial palsy Multiple familial hemangioma	TL	CN VIII CN VII	TR No	Deaf	Same
Alobid et al. [23]	61 M	Progressive profound deaf HL Tinnitus Progressive FP	RS	CN VII	TR No	Same deaf	Same
Shaïda et al. [24]	30 F	Progressive profound HL unsteadiness Tinnitus FP	TL	CN VII	TR No	Deaf Unsteadiness improved	Improved
Sepehrina et al. [25]	53 M	Progressive Moderate HL Serviceable Tinnitus Progressive FP	RS	CN VII	TR No	Worse hearing loss	Improved
Zhu et al. [26]	40 M	Progressive severe HL, Tinnitus, vertigo Sudden facial palsy	Progressive	Progressive	Progressive	Progressive	worse
	27 M	Progressive sever HL, Tinnitus, vertigo, progressive FP	TL	CN VII CN VIII	TR No	Deaf	Same
	31 M	progressive mild HL, serviceable , Tinnitus vertigo, progressive FP	MFA	CN VII CN VIII	TR No	Deaf	same
	37 F	Progressive severe HL , Tinnitus, Recurrent facial palsy	TL	CN VII CN VIII Facial- facial Anastomosis	TR No	Deaf	Same palsy
	32 F	Progressive severe HL , Tinnitus, Facial spasm	TL	CN VII CN VIII Facial- Facial anastomosis reconstruction	TR No	Deaf	Worse facial palsy Facial spasm Improved

	23 M	Mild HL, Tinnitus	Wait , scan				
Oldenburg et al. [27]	34 M	Sudden profound HL Sudden facial palsy	TL		STR Yes	Deaf	Same
	43 M	Progressive profound HL	TL		NTR No	Deaf	Improve
		Progressive FP					
	60 M	Progressive severe HL	TL		NTR No	Deaf	Mild postoperative FP
	18 M	Progressive profound HL Progressive FP	TL		NTR No	Deaf	Improved
	41 M	Progressive profound HL	TL		NTR No	Deaf	Postoperative FP
	47 M	Moderate progressive mild HL(serviceable)	RS		NTR No	Deaf	Normal
	49 M	Moderate progressive mild HL(serviceable)	RS		NTR No	Deaf	Normal
	28 M	Mild progressive mild HL serviceable	MFA		NTR No	Deaf	Normal
	49 F	Progressive profound HL	TL		NTR Yes	Deaf	Normal
	66 M	Progressive severe HL	RS		NTR No	Deaf	Normal
	36 M	Sudden severe HL	TL		STR Yes	Deaf	Normal
	56 M	Progressive profound HL	TL		NTR Yes	Deaf	Postoperative FP
	Mastronardi et al. [28]	22 F	Vertigo, Progressive mild HL serviceable	RS	CN VII CN VIII	NTR No	Hearing same
Hanamitsu et al. [29]	47 M	Progressive profound HL Progressive FP	TL	CN VIII	TR No	Deaf	same
Bonfortei al. [30]	45 M	Progressive Profound HL	TL	CN VIII	TR No	same	normal
Nakashima et al. [31]	38 M	Progressive profound HL	TL	CN VII CN VIII	STR No	Deaf	Postoperative FP
Hekmatere et al. [32]	41 M	Progressive Severe HL Tinnitus Vertigo	TL	CN VIII	TR No	Deaf Vertigo improved	intact
Silveira et al. [33]	21 M	Moderate progressive serviceable Vertigo	RS	CN VII CN VIII	TR No	Deaf worse Vertigo improved	No FP

Magliulo et al. [34]	38 F	Progressive severe profound HL Dizziness Tinnitus Progressive Facial palsy	TL	CN VIII Facial reconstruction great auricle nerve	TR No	Deaf	Improved
Mahran et al. [35]	58 F	Sudden profound HL Vertigo Facial spasm Tinnitus	RS	CN VIII CNVIII	TR No	Deaf Vertigo improved	Improve Facial spasm
Refass et al. [36]	36 F	Sudden deaf HL Tinnitus	TL	CN VIII	TR No	Deaf	same
Matias-Guiu et al. [37]	24 F	Progressive profound HL Tinnitus	RS	CN VIII	TR No	Deaf	Same
Ferrante et al. [38]	24 F	Acute profound HL, vertigo	RS	CN VIII	TR No	Deaf Vertigo improved	Same
Shao-yan et al. [39]	47 M	progressive profound HL Progressive FP	TL	CN VIII	TR No	Deaf	Same FP
Moore et al. [40]	45 M	Progressive profound Hearing loss Imbalance Headache	RS	CN VIII superior vestibular nerve	TR No	Deaf	Transient FP
Deshmukh et al. [41]	67 M	Sudden sever HL Sudden FP	RS	CN VII CN VIII	TR Yes	Same	Improved
	53 M	Sudden severe HL Sudden FP Multiple familial hemangioma headache	RS	CN VII CN VIII	TR Yes	Same	Improved
Ahmad et al. [42]	45 M	Vertigo Tinnitus Progressive Profound HL Facial spasm	TL	CN VII CN VIII	TR No	Same hearing Vertigo improved	Mild postoperative facial palsy Facial spasm improved
Jun Shim et al. [43]	5 M	Sudden Profound HL	Observation		TR Yes		
Di rocco et al. [44]	23 F	Progressive severe HL(60-70 dB) Acute FP	RS		TR Yes	Same	Improved

Demographic

There were 81 patients of age ranged from 5 to 69 with majority of the patients between 20 to 50 year old. There were 57 males and 24 females in the study (Figures 1 & 2).



Symptoms

78 patients had hearing loss (96%). 11 patients of them had sudden hearing loss (14%), while the other 67 patients had progressive hearing loss (86%). 16 patients had serviceable hearing loss (20%), while the other 52 patients had non-serviceable hearing a loss (80%).

46 patients had tinnitus (56%), 31 patients had vestibular symptoms (38%) (16 patients had vertigo and 15 patients had unsteadiness). 30 patients had facial palsy (37%), 6 patients of them had sudden facial palsy (20%), 3 patients of them had recurrent facial palsy (10%), while the other 21 had progressive facial palsy (70%). 13 patients had facial spasm (16%). 2 patients had headache (3%), and 2 patients had familial multiple hemangioma (3%) (Table 2).

Table 2: IAC Hemangioma Symptoms.

Hearing loss	Tinnitus	Vertigo and unsteadiness	Facial palsy	Facial spasm	Headache
96%	56%	38%	37%	16%	3%

Management

Table 3: Hearing outcomes after surgery.

	Normal hearing	Serviceable hearing loss	Non serviceable
Patients	3	15	51
Improved	2	5	0
Percentage	66% preserve hearing	33% preserve serviceable hearing	0% preservation

Table 4: IAC Hemangioma management.

Observation	MFA	RS	TL
2	8	29	42
3%	9%	35%	51%
3%	9%	35%	51%

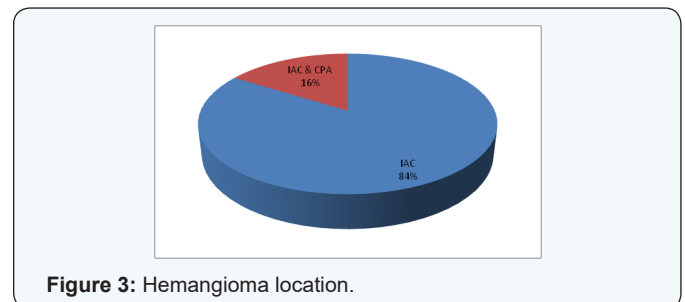
Table 5: Facial palsy outcomes after surgery.

	Improved	Same	worse
6 patients with acute FP	4	1	1
3 patients with recurrent FP	1	1	1
21 patients with progressive FP	6	11	5
Total	11 (36%)	13 (43%)	6 (23%)

Table 6: Facial reconstruction types.

Facial- Facial anastomosis	Facial- hypoglossal anastomosis	Sural nerve graft	Great auricle nerve graft
10	3	2	1

Two patients were managed by observation. 79 patients had a surgery, 3 of them had normal hearing, and 15 patients of them had serviceable hearing loss, while the other 51 patients had non-serviceable hearing loss (Table 3). Only 11 articles reported the postoperative clinical progress of vestibular symptoms, and all reported patients with vestibular symptoms improved. 13 patients had preoperative facial spasm, and it disappeared in all of them postoperatively. Two patients were managed conservatively, 8 patients had MFA, and 29 patients had RS approach, while the other 42 patients had TR approach (Table 4). 30 patients with facial palsy had a surgery, 11 patients of them had facial weakness improvement (Table 5). 16 patients had facial reconstruction (20%) (Table 6). 68 patients had a limited disease to IAC, while 13 patients had disease extension



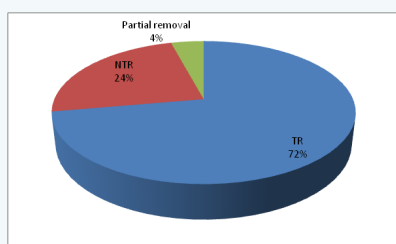


Figure 4: Resection type.

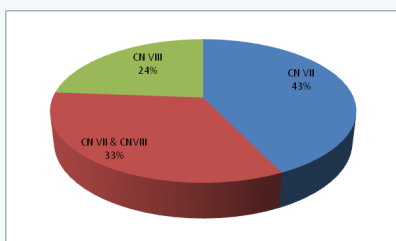


Figure 5: Hemangioma Nerve attachment.

into CPA (Figure 3). 72 articles reported the surgical removal type, 52 patients of them had a total surgical resection, and 17 patients of them had a near total resection while the other 3 patients had only partial resection (Figure 4). Hemangioma attachments were reported in 63 patients, 27 patients of them had CN VII attachment, and 21 patients of them had CN VII & CN VIII attachment, while the other 15 patients had CN VIII attachment (Figure 5).

Results

Most patient were male with age ranging between 20 to 50 years old. Most patients had non-serviceable hearing loss. 38% patients had vestibular symptoms, 37% patients had facial palsy, 16% patients had facial spasm. Only third patient with serviceable-hearing loss preserved their hearing abilities after surgery, third patient with facial palsy had significant improvement after surgery (acute facial palsy has a better prognosis than progressive facial palsy), and all patients with facial spasm and vestibular symptoms had a good improvement. Most cases were located primary to IAC, most cases had attachment to facial nerve and can be removed totally, and about 20% of patients had facial reconstruction surgery due to advanced facial nerve involvement.

Conclusion

IAC hemangioma is a rare disease with poor outcomes prognosis, we should suspect this disease in patients with progressive hearing loss and facial palsy with small lesion in internal auditory canal vertigo and Tinnitus.

Discussion

Vestibular schwannoma is the most common tumor in IAC and the cerebellopontine angle (CPA). Other tumor lesions of CPA area include meningioma, primary cholesteatoma, facial

nerve neuroma, various vascular tumors, metastatic tumors, and others. Cavernous angioma was reported rarely in the IAC. Sundares et al. reported the first case of IAC cavernous angioma in 1976. These tumors were considered to originate from the capillary bed of the epineurium nerve. Vascular steal mechanism in which the blood is taken by tumor instead of the nerve causing nerve function loss even with a small size of tumor. Histopathologically, they consist of large thin-walled blood vessels that lined by flattened endothelium, which stain positive by endothelial marker CD 31, the stroma is composed of fibrous component and has mainly myofibroblast and fibroblast that stain positive for smooth muscle actin.

Depending on nerve origin and location, these tumors can cause severe progressive or sudden sensorineural hearing loss, tinnitus, sudden or progressive facial nerve palsy, facial spasm, vertigo and disequilibrium even when they are in small size. The tumor size is usually less than 10 mm. On CT scan, IAC hemangioma appear as iso-or hyper- dense lesion with slight enhancement after intravenous administration of contrast, usually stippled calcifications could also be seen with enlargement of the IAC. On MRI, It appears as lobular and isointense in T1 and hyperintense on T2 with heterogeneous T1 post - gadolinium enhancement. The main differential diagnosis is IAC Vestibular shwannoma (Table 7). Other differential diagnosis may include meningioma, lipoma, melanoma, hamartoma, and lymphoma.

Table 7: IAC Hemangioma V/S IAC Vestibular shwannoma.

Intra-meatal CH	Intra-meatal vestibular shwannoma
Non-serviceable hearing	serviceable hearing
Facial palsy	Normal facial function
MRI lobular and isointense in t1 and hyper intense on t2 with heterogeneous t1 post - gadolinium	Round or oval And have more homogeneous gadolinium uptake

Complete surgical resection with avoiding complications such bleeding is the goal of treatment. Radiotherapy may promote growth and hemorrhage, so it is not recommended. No symptomatic cases can be managed conservatively. Symptomatic case should be resected surgically. Surgical approach is depended on hearing deficit and tumor size. Translabyrinthine approach is recommended for patient with non-serviceable hearing loss. Middle fossa approach and retrosigmoid approach are recommended for patients with serviceable hearing loss. This lesion could be attached firmly with facial nerve. Since the tumor is benign and slow growing, it is advocated to perform a near total resection in case where the tumor is difficult to dissect from facial nerve [18,26,27].

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Conflict of interest

Author declared no conflict of interest

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