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Case Report

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Contralateral sensorineural hearing loss (SNHL) after vestibular schwannoma surgery: report of 4 cases

Abstract

Contralateral sensorineural hearing loss after vestibular schwannoma (VS) resection has been described, resulting in a severe complication, especially if hearing preservation in the operated side was not a reachable outcome. There exist several theories that would explain this complication, without any guideline of treatment established. We report four patients treated in our institution who developed a severe contralateral SNHL after surgery. After medical treatment only one patient recovered hearing (moderate SNHL) and the other 3 presented a severe SNHL. Cochlear implant was the only treatment of choice in two of them.

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Introduction

The vast majority of cerebellopontine angle (CPA) tumours are vestibular schwannomas (VS) (80%).[1,2] There are several different treatment options for treating VS. Microsurgical resection of VS is one of the treatment options, which has potential complications such as cerebrospinal fluid (CSF) leak, meningitis, cranial nerve damage, and intracranial haemorrhage.[3] Recently, contralateral sensorineural hearing loss after VS resection has been described, resulting in a severe complication, especially if hearing preservation in the operated side was not a reachable outcome. We described our experience of 4 patients with VS who developed a contralateral SNHL after acoustic neuroma removal.

Cases report

We performed a review of the VS operated in our institution between 2004 and 2015, finding a total of 185 cases. Four of these patients developed a contralateral SNHL after VS surgery (Table 1). They were 3 men and 1 woman, with an average tumour size of 19,5 mm (range 7,8-30mm). Three of them were operated by a retrosigmoid approach, and the other one by a translabyrinthine approach. At the time of diagnosis of the VS, 2 patients had normal hearing (pure tone average (PTA): 20 and 22 dB) and 2 has mild hearing loss (PTA: 26 and 40 dB). After surgery all patients developed a complete hearing loss in the operated ear. The median time of appearance of the contralateral SNHL was 16months (range 2-54months) with an average of hearing loss in the contralateral ear at the moment of diagnosis of 46dB. Moreover, 3 patients developed tinnitus in the contralateral ear and 2 of them developed also episodic vertigo.

All were treated with intratympanic corticosteroids (dexamethasone 4mg/ml one injection weekly for three weeks) and 1 of them was also treated with oral corticosteroids (prednisone 1mg/kg /day for one month with dose reduction every five days). As a result of the treatment, there was a stabilization of hearing loss in 1 patient (first degree moderate hearing loss 46dB,) and a severe SNHL (85-95dB) was developed in the other three patients. Two of these patients were candidates for cochlear implantation and the other one developed a severe neurological impairment for what he was not a candidate for cochlear implant.

Discussion

Contralateral SNHL after VS removal is an extremely rare surgical complication, being described also in other posterior fossa procedures for other CPA tumours.[4,5] The mechanism of contralateral hearing loss remains unclear, including causes like meningitis, ototoxicity, acoustic trauma due to drill noise, vascular compromise, autoimmune reaction, and compensatory endolymphatic hydrops.[5]

Meningitis seems a strange cause of contralateral SNHL, because this complication often occurs in the setting of a CSF leakage and has a typical clinical presentation, which did not appear in any of our cases.[3]

Tos et al. examined the effects of drill noise after a translabyrintine approach in the contralateral ear in 50 consecutive cases, being unable to detect one single case of contralateral SNHL.[6] Vascular compromise is another possible cause of contralateral SNHL, which has been described principally in relation to cardiac surgery. In this scenario the hearing loss develops early (less than 1week) and it mainly affects high frequencies, probably due to blood distribution or embolic events.[7,8] In our cases the hearing loss appeared several months after surgery and it affected all the frequencies in the audiogram, making this cause unlikely.

Loss of cerebrospinal fluid (CSF) is another of the possible reasons of contralateral hearing loss, especially during the acoustic neuroma surgery.[9] In normal conditions the pressures of CSF, endolymph and perilymph are equal. During the surgery, the loss of CSF pressure is transmitted to the perilymph via the cochlear aqueduct, generating a compensatory expansion of the endolymph, similar to a endolymphatic hydrops. Lusting et al.,[5] in their review of cases of contralateral SNHL after neurotologic surgery, supports this theory being based in 2 facts; the first was the result of a electrocochleography made to one of his patients, that showed an increase of the SP/AP potential, highly indicative of endolymphatic hydrops; the second one is the fact that

3 of his patients presented a postoperative CSF fistula. They reported a 3 months recovery for the hearing loss. This theory could explain our results considering the type of surgical approach, but in our cases none of our patients presented a postoperative fistula and our hearing results were comparatively worse.

The autoimmunity is another theory that might explain the contralateral hearing loss. The surgical injury could result in a release of sequestered antigens to the systemic circulation, which would be capable of damaging to the contralateral ear, what has been named in ophthalmology as sympathetic ophthalmia, in which an immunologic response following eye trauma or surgery injuries the contralateral eye.[10,11] This has been studied in animal models in which sensitized lymphocytes were able to transfer autoimmune inner disease, resulting in cellular infiltration by neutrophil granulocytes and lymphocytes in the scala tympani, loss of outer hair cells in the apical turn and loss of detection of TEOAE in the studied animals.[12]

Sympathetic cochleolabyrinthitis represents a explanation considering the time of onset, 80% between the first two weeks and three months and 10% in the following year in the sympathetic ophthalmia,[11] the loss of all frequencies, the association with vertigo and the good response of one of our patient to corticosteroids.

Table 1 Patients with contralateral hearing loss after acoustic neuroma surgery

Case	Age	Sex	Side	Size (Mm)	Surgical Approach	Contralateral Preop HL (dB)	Onset (Months)	Associate Symptoms	Outcome
1	52	F	R	22	RS	22	2m	Vertigo	Severe SNHL*
2	53	M	R	7,8	RS	20	2m	Vertigo/ Tinnitus	Moderate SNHL
3	46	M	R	18	TL	26	29m	Tinnitus/ Joint pain	Severe SNHL^
4	46	M	L	22	RS	40	43m	Vertigo	Severe SNHL*

RS: Retrosigmoid Approach; TL: Translaberynthine Approach; *Cochlear Implant; ^Neurologic impairment

With regard to the treatment, established guidelines do not exist, and the use of high doses of corticosteroids has been recommended and the use of cochlear implants in cases with no recovery and complete hearing loss.[4]

Contralateral SNHL after VS surgery is a rare but catastrophic complication that should be keep in mind by the surgeon.

Conflicts of interest

Author declares there are no conflicts of interest.

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