Save the nerve

TO THE EDITOR: We read with keen interest the article by Yamakami and associates regarding the resection of small acoustic neuromas through the retrosigmoid approach (Yamakami I, Ito S, Higuchi Y: Retrosigmoid removal of small acoustic neuroma: curative tumor removal with preservation of function. J Neurosurg 121:554–563, September 2014). We commend the authors for the excellent outcome they achieved with their technique and believe that their article is a decisive one with regard to the preference of surgical removal of small vestibular schwannomas, particularly in younger patients, over other options. Although their emphasis was on preserving serviceable hearing, the success in preserving any hearing, regardless of how poor it might be, indicates the viability of the cochlear nerve. Preserving the hearing anatomy (the inner ear and cochlear nerve) in all patients for preservation of hearing or potential functional restoration has been our avid interest and has incited us to rethink the management of all acoustic tumors, regardless of the size or the patient’s hearing status.

The remarkable success of cochlear implants in restoring hearing in patients with postlingual deafness is, in our opinion, a “game-changer” in the management of all vestibular schwannomas. In postlingual deaf patients, cochlear implants offer 70%–100% word recognition and 65%–80% sentence recognition. Modern cochlear implants have the far more ambitious goal of restoring speech perception for patients. In favorable hearing conditions and with auditory training, implantation of these devices can lead to an appreciation of more complex sound, including aspects of music perception. Impressive results have been obtained with cochlear implantation in patients with neurofibromatosis Type 2, as long as the nerve is kept intact. Preserving the hearing, the cochlea, and the cochlear nerve in patients with unilateral acoustic neuromas.

The translabyrinthine approach inescapably sacrifices hearing, even though some pathological studies have suggested that some spinal ganglion cells might still be alive after labyrinthectomy. The middle fossa approach puts the facial nerve at higher risk. Although the middle fossa approach might be equal to the posterior fossa approach in preserving serviceable hearing, it might risk the cochlea and the part of the nerve near the fundus. In particular, this approach might involve dissection distally in the fundus, and reports show that a distal extension into the meatus is a significant adverse factor in preserving hearing. In addition, it was thought that a posterior fossa approach is more advantageous as far as complications are concerned. In the quest to preserve the cochlear nerve and function, we believe that the posterior fossa approach should be the approach of choice to all acoustic tumors. To alleviate the inherent risk of cerebellar retraction, which is associated with the retrosigmoid approach, we use the transmastoid approach and finesse it with endoscopic techniques.

Decreasing the prescribed radiosurgery dose to 12–13 Gy has been reported, with a rate of 61%–78% early hearing preservation of patients with small tumors. Undeniably, however, there have been definitive, progressive, and permanent declines of hearing over the years after radiosurgery, to a very low level of hearing. The damage appears on the cochlear nerve, at the cochlear level, and the salient, identifying factor is a cochlear dose higher than 3 Gy. In one study, the only patients who maintained hearing were those who received a cochlear dose of less than 2 Gy. Exceeding such a dose is expected in all radiosurgery patients, with rare exceptions. Linskey and colleagues calculated the doses that different parts of the cochlea receive during radiosurgery for acoustic tumors, and found a range of 5–8 Gy. These facts suggest that radiation-induced injury would compromise the potential for hearing restoration through a cochlear implant, and that radiosurgery is disadvantageous for long-term preservation or potential restoration of hearing.

Preserving hearing, the cochlea, and the cochlear nerve is highly achievable in patients with tumors of all sizes, including giant ones, through the retrosigmoid approach. The cochlear nerve was preserved in 84% of a recent series of 200 patients reported by Samii et al. Most patients would be candidates for hearing restoration even if useful hearing was not preserved. Admittedly, the value and experience in applying a cochlear implant in the presence of another good hearing ear has yet to be determined, but the potential is vast.

Hence, as Yamakami and his colleagues recommended for the small tumors, we advocate curative tumor removal with the preservation of the cochlear nerve for potential hearing restoration in all surgically fit patients, regardless of the tumor size or the hearing status.

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References


Response

We greatly appreciate Dr. Al-Mefty and colleagues’ interest in our article concerning the retrosigmoid curative removal of small acoustic neuroma with functional preservation. Dr. Al-Mefty advocates the curative removal of tumor with hearing and cochlear nerve preservation in all patients with acoustic neuroma, regardless of the tumor’s size or the patient’s hearing status. We agree that, even in the large acoustic neuroma, the optimum goal is curative tumor removal with preservation of the facial nerve and hearing, and that surgeons must make every effort to accomplish this goal. Actually, during the same study period of 1998–2012 as our article, we accomplished curative tumor removal with facial nerve and hearing preservation in 8 patients with large acoustic neuroma (30- to 50-mm tumor diameter; our unpublished data). We have the possibility to accomplish both curative tumor removal and hearing preservation, even in large acoustic neuromas. However, the possibility is much smaller than 84% in small acoustic neuromas with preoperative hearing, which our article reported.

Expressing the possibility of hearing restoration by the future development of cochlear implants, Dr. Al-Mefty points out the importance of anatomical preservation of the cochlear nerve. Using continuous monitoring of cochlear nerve compound action potential (CNAP) during removal of small acoustic neuromas with hearing preser-