



Radiosurgery treatment is associated with improved facial nerve preservation versus repeat resection in recurrent vestibular schwannomas

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Dear Editor,

We read with great interest the recent article by Romiyo et al. [4] discussing facial nerve outcomes after stereotactic radiosurgery (SRS) versus repeated microsurgical resection (MS) in recurrent vestibular schwannomas (VS). Fifteen individual studies for a total of 359 patients were analyzed. The purpose was to assess adjuvant radiotherapy for recurrent VS as compared with MS, in terms of functional outcomes and local tumor control (LTC). The authors conclude that secondary SRS for recurrent VS is associated with better preservation of facial nerve function, while having comparable LTC with MS.

A first aspect, which might be subject of a debate, is whether radiosurgery and radiotherapy are similar techniques. The authors consider, among with other radiotherapy techniques, SRS by Gamma Knife (GK), as a primary modality for VS treatment. However and recently, the International Stereotactic Radiosurgery Society Guidelines (ISRS) for VS

separately analyzed outcomes of single fraction GK and Linac as different from fractionated stereotactic radiation therapy (either hypofractionated or conventional) [7]. Single fraction SRS is usually applicable for small to medium size tumors, with small radiation doses ranging between 11 and 14 Gy at the tumor margin, while yielding a high LTC, between 81 and 100%, and generally considered as high as 95–97% [7]. In this sense, one has to make the difference among all these techniques, which might have separate indications, dose regimens, and specific outcomes. Moreover, for small-to-medium size VS, single fraction is considered the reference SRS technique (with 80% of agreement among the ISRS Board members and with level 4 evidence) [7]. For large VS, microsurgery is usually considered the reference technique, followed or not by upfront SRS on the residual tumor (please see below) [1, 6].

A second aspect and more important, is that one of our recent studies [1], is probably quoted in Fig. 2 and further not in the references, and follows a series of studies of repeat MS for recurrent VS (group B of the present paper [4]). However, our study shows the results of a new surgical paradigm, developed by our team together with other groups [1, 6, 10], which implies planned subtotal resection followed by Gamma Knife SRS on the remnant VS, after a mean time of 6 months after MS. Our philosophy was to develop a new paradigm for large VS, aiming at better patient's functional outcome. Using this approach, we reported 91.6% LTC and no facial palsy (100% House-Brackman grade I postoperatively), with additionally 94.1% of patients retaining serviceable hearing, if they had one before surgery [1]. Our series included, indeed, among the 32 patients, a low number of five cases (15.6%) with recurrent VS, of whom three were GK failures and two previously had fractionated radiation therapy and Linac SRS, respectively. Nevertheless, the vast majority of cases (85%) were first intention treatment (MS plus SRS by GK). Moreover, all 32 patients benefitted from a

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combined approach, as previously described [1]. Surgery and radiosurgery were proposed and applied to all patients, as a complete treatment formulae. In the same sense, in a recent systematic review, our team (Starnoni et al. [5]) coined the term “nerve-centered approach” to describe this type of paradigm shift in VS management [5]. Overall House-Brackman grade I-II was achieved in 96.1% of patients (95% CI 93.7–98.5%), while serviceable hearing was maintained in 59.9% (95% CI 36.5–83.2%) [5].

A third aspect is that patients with more than one surgical procedure before SRS might have more aggressive tumors, difficult to manage with resection, and tend to have worse outcomes [2]. Moreover, there are a significant proportion of patients, which have facial nerve dysfunction after primary MS treatment, frequently associated with the number of previous surgeries. Some authors also consider recurrent VS as depending on the extent of resection [6].

A fourth aspect is related to improvement in facial nerve function after SRS for recurrent VS after primary MS. The rate of improvement might achieve 30% [2] and is related to early SRS and subtotal resection to anatomically preserve the nerve.

A last aspect is related to the quality of life (QOL), which goes beyond facial nerve function [3]. Hearing preservation or vertigo is of further interest. Vertigo is frequently present after more than one MS resection and further resolves more easily after SRS in cases with single previous MS.

In our experience, we offer patients SRS as a primary treatment for small to medium size tumors [8, 9], while performing subtotal resection followed by GK on the tumor remnant for large VS, in the frame of a combined approach [1, 9]. Adverse radiation effects are rare and disappear with a short course of corticosteroid treatment in a vast majority of cases [8]. The study of Romiyo et al. [4] adds to the evidence that SRS for recurrent VS after previous MS is a valuable treatment option, while being minimally invasive, preserving facial nerve function and with high LTC rates.

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Compliance with ethical standards

Conflict of interest The authors declare that they have no conflict of interest.

Ethics approval For this type of letter, no ethical committee approval is necessary.

References

- Daniel RT, Tuleasca C, George M, Pralong E, Schiappacasse L, Zeverino M, Maire R, Levivier M (2017) Preserving normal facial nerve function and improving hearing outcome in large vestibular schwannomas with a combined approach: planned subtotal resection followed by gamma knife radiosurgery. *Acta Neurochir* 159: 1197–1211
- Huang MJ, Kano H, Mousavi SH, Niranjana A, Monaco EA 3rd, Arai Y, Flickinger JC, Lunsford LD (2017) Stereotactic radiosurgery for recurrent vestibular schwannoma after previous resection. *J Neurosurg* 126:1506–1513
- Regis J, Pellet W, Delsanti C, Dufour H, Roche PH, Thomassin JM, Zanaret M, Peragut JC (2002) Functional outcome after gamma knife surgery or microsurgery for vestibular schwannomas. *J Neurosurg* 97:1091–1100
- Romiyo P, Ng E, Dejam D, Ding K, Sheppard P, Duong C, Franks A, Ong V, Udawatta M, Phillips W, Gopen Q, Yang I (2019) Radiosurgery treatment is associated with improved facial nerve preservation versus repeat resection in recurrent vestibular schwannomas. *Acta Neurochir*
- Starnoni D, Daniel RT, Tuleasca C, George M, Levivier M, Messerer M (2018) Systematic review and meta-analysis of the technique of subtotal resection and stereotactic radiosurgery for large vestibular schwannomas: a “nerve-centered” approach. *Neurosurg Focus* 44:E4
- Troude L, Boucekine M, Montava M, Lavieille JP, Regis JM, Roche PH (2018) Adjunctive gamma-knife surgery or wait & scan policy after optimal resection of large vestibular schwannomas: clinical and radiological outcomes. *World Neurosurg*
- Tsao MN, Sahgal A, Xu W, De Salles A, Hayashi M, Levivier M, Ma L, Martinez R, Regis J, Ryu S, Slotman BJ, Paddick I (2017) Stereotactic radiosurgery for vestibular schwannoma: international stereotactic radiosurgery society (ISRS) practice guideline. *Journal of Radiosurgery & SBRT (Stereotactic Body Radiation Therapy)* 5: 5–24
- Tuleasca C, George M, Faouzi M, Schiappacasse L, Leroy HA, Zeverino M, Daniel RT, Maire R, Levivier M (2016) Acute clinical adverse radiation effects after gamma knife surgery for vestibular schwannomas. *J Neurosurg* 125:73–82
- Tuleasca C, Levivier M (2018) A virtual musician quartet with vestibular schwannoma. *Lancet Oncol* 19:1025
- van de Langenberg R, Hanssens PE, van Overbeeke JJ, Verheul JB, Nelemans PJ, de Bondt BJ, Stokroos RJ (2011) Management of large vestibular schwannoma. Part I. planned subtotal resection followed by gamma knife surgery: radiological and clinical aspects. *J Neurosurg* 115:875–884

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