Current Radiosurgery and Fractionated Stereotactic Radiotherapy Results for Acoustic Neuroma

Patients should be aware that research articles that are more than five years old in the field of radiosurgery and radiotherapy do not represent current outcomes and methods of treatment. Researchers are constantly refining the techniques and lowering the radiation dose to allow the least amount of permanent side effects and the most preservation of useful hearing, along with maintaining a high tumor growth control rate. Therefore this table has been designed with recent research articles (2001-2003) from well-respected researchers in the field who treat an abundance of acoustic neuroma patients. Long-term results exist for Gamma Knife with a range from 17 years in the USA to 30 years world-wide. Fractionated treatments do not have long-term results at this time.

A review of this table shows the following:

- Gamma Knife or LINAC radiosurgery (one-session) appear to have good useful hearing preservation rates (70-71%).
- Fractioned radiotherapy with LINAC or Proton Beam have much lower rates of preservation of useful hearing (31-61%).
- Proton Beam did not provide good results for useful hearing, whether treatment was in one session or fractionated (31-33%).
- Gamma Knife had substantially lower rates of facial weakness (1-4%) and facial numbness (0-0.5%) compared to permanent facial problems presented in research from one-session radiosurgery LINAC groups (8-18%), Proton Beam groups (9-11%) and fractionated LINAC groups (2-12%).

<u>Conclusion:</u> At this time, the best overall results are obtained with Gamma Knife surgical technology. There appears to be no advantage to fractionated treatments for the patient unless radiosurgery (one-session) with Gamma Knife, or alternatively LINAC, is not available.

	Number of Patients	Radiation in Gy	Median Follow-up (Months)	Tumor Growth Control	Facial Weakness (Permanent)	Facial Numbness (Permanent)	Useful Hearing Preserved
Gamma Knife Surgery	190[1]	12–13 Gy	30	97.1%	1%	0.5%	71%
	97[2]	12–14 Gy	36	97%	4%	0%	70%
LINAC Radiosurgery	44[3]	11–20 Gy	32	98%	8%	18%	71%
	139[4]	12.5 Gy	36	93%	12%	10%	Not Reported
Proton Beam Radiosurgery	88[5]	12 Gy	38.7	93.6%	9%	11%	33.3%
Fractionated Stereotactic Radiotherapy (FSR), LINAC or Proton Beam (Multiple Sessions)	65[6] LINAC	44-50 Gy (20–23 Fractions)	37	92%	12%	5%	47%
	80[7] LINAC	20 Gy (4–5 Fractions)	33	94%	2%	3%	61 %
	29[8] Proton Beam	54–60 Gy (30–33 Fractions)	34	100%	0%	0%	31 %

[1] Flickinger JC, Kondziolka D, Niranjan A, Lunsford LD. Results of acoustic neuroma radiosurgery: an analysis of 5 years= experience using current methods. *J Neurosurg* 2001;94(1):1-6. [2] Regis J, Pellet W, Delsanti C, et al. Functional outcome after gamma knife surgery or microsurgery for vestibular schwannomas. *J Neurosurg* 2002;97(5):1091-100. [3] Spiegelmann R, Lidar Z, Gofman J, et al. Linear accelerator radiosurgery for vestibular schwannoma. *J Neurosurg* 2001;94(1):7-13. [4] Foote KD, Friedman WA, Buatti JM, et al. Analysis of risk factors associated with radiosurgery for vestibular schwannoma. *J Neurosurg* 2001;95(3):440-449. [5] Weber DC, Chan AW, Bussiere MR, et al. Proton beam radiosurgery for vestibular schwannoma: tumor control and cranial nerve toxicity. *Neurosurgery* 2003;53(3):577-586. [6] Sakamoto T, Shirato H, Takeichi N, et al. Annual rate of hearing loss falls after fractionated stereotactic irradiation for vestibular schwannoma. *Radiother Oncol* 2001;60(1):45-8. [7] Meijer OW, Vandertop WP, Baayen JC, Slotman BJ. Single-fraction vs. fractionated linac-based stereotactic radiosurgery for vestibular schwannoma: a single institution study. *Int J Radiat Oncol Biol Phys* 2003;56(5):1390-6. [8] Bush DA, McAllister CJ, Loredo LN, et al. Fractionated proton beam radiotherapy for acoustic neuroma. *Neurosurgery* 2002;50(2):270-273.

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