

Effectiveness of Proactive Microanatomy-Based Low-Dose Radiosurgery of Vestibular Schwannomas for Hearing Preservation in Patients With Neurofibromatosis Type 2

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Abstract

Introduction: The role of stereotactic radiosurgery (SRS) in management of vestibular schwannomas (VS) in patients with neurofibromatosis type 2 (NF2) remains unclear¹⁻³. In our University in such cases proactive low-dose SRS is performed.

Method: The objective of this retrospective study was evaluation of the effectiveness of proactive microanatomy-based low-dose SRS of VS for serviceable hearing preservation in patients with NF2. The study cohort included 16 VS in 13 patients, who underwent SRS between January 2002 and March 2022. Median tumor volume was 0.56 cc (range, 0.12 - 2.75 cc). Hearing on the side of treated tumor corresponded to Gardner-Robertson classes I (12 cases) or II (4 cases). The prescription dose was 12 Gy (15 cases) or 11 Gy (1 case), and was delivered at 50% (13 cases) or >50% (3 cases) isodose line. Median maximal cochlear dose was 5.8 Gy (range, 2.2 - 8.2 Gy). Hearing preservation without deterioration and serviceable hearing preservation were evaluated.

Result: Median posttreatment follow-up was 88 months (range, 30 - 226 months). Actuarial proportions of cases without hearing deterioration at 3, 5, and 10 years after SRS were, respectively, 0.81 ± 0.10 , 0.67 ± 0.12 , and 0.56 ± 0.14 . Actuarial proportions of cases with serviceable hearing preservation at 3, 5, and 10 years after SRS were, respectively, 0.81 ± 0.10 , 0.81 ± 0.10 , and 0.67 ± 0.15 . Gardner-Robertson class II hearing at the time of treatment and used prescription isodose of >50% showed statistically significant associations with subsequent hearing deterioration ($P = 0.0242$ and 0.0024 , respectively) and serviceable hearing loss ($P = 0.0047$ and 0.0020 , respectively). Specifically, actuarial proportions of cases with serviceable hearing preservation at 5 years after SRS in cases with Gardner-Robertson classes I and II hearing were 1.00 and 0.25 ± 0.22 , respectively ($P = 0.0009$).

Discussion: This study on SRS of NF2-associated VS demonstrates a significant difference in serviceable hearing pre-

servation between cases with Gardner-Robertson class I and class II at the time of treatment. It can be suggested, that these patients should undergo SRS earlier, before development of the irreversible alteration of the cochlear nerve axons. For treatment planning it is important to understand the microanatomy of the tumor and adjacent structures, as well as presume possible chronology of the tumor growth.

Conclusions: Gardner-Robertson class I hearing at the time of SRS for VS in patients with NF2 is associated with significantly higher chances of serviceable hearing preservation during subsequent long-term follow-up. It may advocate use of early proactive microanatomy-based low-dose SRS in such cases, particularly in younger individuals.

References

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