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A Retrospective Analysis of Dose to Semicircular Canals in Stereotactic Radiosurgery Patients

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Abstract
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Amelia Wexler [1] , Gregory Biedermann [2] , Derik Russell [3]

1. Radiation Oncology, University of Missouri, Columbia, USA 2. Division of Radiation Oncology, University of Missouri School of Medicine, Columbia, USA 3. Medical Physics, National University of Ireland Galway, Galway, IRL

Corresponding author: Amelia Wexler, wexlera@health.missouri.edu

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Abstract

Objective: To evaluate the dose to the semicircular canal (SCC) in patients undergoing stereotactic radiosurgery (SRS) for acoustic schwannoma.

Methods: A retrospective evaluation of the dose to the inner ear structures for patients treated using LINAC-based SRS was performed. The acoustic schwannoma prescription was 1250cGy to the 80% isodose line. Using an MRI T1-weighted post contrast isotropic imaging sequence and Varian Eclipse v13.7 treatment planning software, the ipsilateral and contralateral cochlea were contoured as well as the left and right SCCs. Upon completion of contouring, data was collected using the dose volume histogram in external beam planning. The volume, the max dose, and the D0.03cc were collected for each structure. The SCC doses were plotted relative to the cochlear doses of the same laterality.

Results: The dataset included 14 patients treated from 2017-2021. The volume of the left and right SCC was on average 0.43cc for the left SCC, 0.40cc for the right SCC. The D03cc for the left SCC ranged from 0.648cGy to 851.1cGy and the D03cc for the right SCC ranged from 1.1cGy to 616.2cGy. For the 8 left and 6 right acoustic schwannoma patients, the ipsilateral cochlea mean D03cc was 646.6cGy while the ipsilateral SCC mean D03cc was 513.0cGy. A side-by-side comparison of each patient's ipsilateral cochlea D03cc to the ipsilateral SCC D03cc showed good correlation of dose between these two structures.

Conclusion: The dose to the semicircular canals varied in the dataset. In some cases, the beam for the treatment plan may have avoided the cochlea but not the semicircular canal; these patients represent the greatest outliers to the otherwise linear correlation between doses. Future studies can correlate higher doses to the semicircular canal and any symptoms via follow-up with acoustic schwannoma patients post treatment.