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Treatment Planning Experience and Methodology for Radiosurgery to the Sphenopalatine Ganglion in a Community Hospital Setting

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Abstract

Objectives:

Functional radiosurgery to the Sphenopalatine Ganglion (SPG) for trigeminal neuralgia is much less common than radiosurgery to the trigeminal nerve adjacent to the brainstem. Treatment of the SPG involves targeting the V2 branch of the trigeminal nerve in the Pterygopalatine fossa where the nerve exits the Vidian Canal. The published literature on this treatment technique is minimal with many publications consisting of single patient case studies. Our institution has nearly 10 years of experience performing radiosurgery to treat the SPG for trigeminal neuralgia, initially on the Truebeam, and also now on the new ZAP-X platform. We would describe the technical aspects of our treatment process for professionals with minimal exposure to this less common treatment indication, along with an extensive literature review.

Methods:

Our institution has historically treated 5-10 SPG patients per year on the Truebeam platform, and since 2023 has treated >15 on the ZAP-X platform. We present details of the physics and dosimetry process including the practical aspects of CT simulation, target identification, treatment planning and dosimetry, QA, and treatment delivery. We also compare and contrast the process and resulting plan dosimetry between the Truebeam and ZAP-X platforms. Published literature describing radiosurgery to the SPG, most commonly reported on the Gamma Knife or CyberKnife, will be presented alongside our process for reference.

Results:

At our institution, the radiation oncologist and neurosurgeon utilize equivalent prescriptions regardless of Truebeam or ZAP-X delivery platform. Treatment on the Truebeam is planned in the Cone Planning module of the Eclipse Treatment Planning System and delivery is frameless with AlignRT surface guidance and CBCT alignment. ZAP-X planning is performed in their dedicated planning software and delivery is frameless with kV image alignment and tracking. Targeting the Pterygopalatine fossa is performed with a 7.5mm diameter ICVI cone on the Truebeam and a 7.5mm diameter aperture on the revolving collimator for the ZAP-X. Treatment on the Truebeam typically utilizes 6 arcs compared to treatment on the ZAP-X that utilizes 200-300 static beams. Treatment on the Truebeam uses 6MV FFF energy with a dose rate of 1400 MU/min and the ZAP-X uses a 3MV FFF energy with a dose rate of 1500 MU/min. Overall treatment delivery times are generally around 45 minutes regardless of delivery platform.

Conclusion(s):

Treatment of the Sphenopalatine Ganglion is technically feasible in the community hospital setting on a variety of delivery platforms.