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# Improvements in Beam Geometry and Treatment Planning for Trigeminal Neuralgia with ZAP-X Conformal Table Insert over Legacy Flat Table Insert

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## Abstract

Objectives:

The ZAP-X Conformal Table purports a 15-25% increase in solid angle available for beams that were previously inaccessible due to potential for collision of the couch with the internal components of the ZAP-X delivery system. We present the plan and dosimetric improvements observed following the installation of the upgraded Conformal Table Insert with regard to treatment of Trigeminal Neuralgia patients on the ZAP-X platform.

Methods:

Prior to the Conformal Table installation/upgrade, we had performed treatments of 3 patients with Trigeminal Neuralgia on the ZAP-X. Following the upgrade, we have performed >7 treatments for Trigeminal Neuralgia on the ZAP-X. The treatment planning dose calculation algorithm is unchanged and a 0.5mm dose grid is used consistently. A single isocenter with a 4mm diameter aperture and a prescription dose of 90Gy to maximum point dose (100%) is used consistently as well. Here we present a technical comparison of the plans to include angular distribution of beams, number of beams, total MU per plan, and treatment delivery time. Dosimetric comparisons will also be made, including maximum dose to brainstem (0.035cc volume) and dose to 0.5cc of brainstem. Additionally, volumes such as the 45Gy, 20Gy, and 10Gy dose distributions are reported and compared and gradient metrics are investigated.

Results:

Preliminary results indicate that the beam distribution is greatly improved, with the entire posterior aspect of the skull now available. For a similar total number of beams, the geometric spread is improved. With improved beam distribution, improved dosimetric parameters are expected. The additional degrees of freedom grant the treatment planner and software optimization algorithm greater ability to prioritize reducing the brainstem dose or minimizing overall low dose spread. On the legacy Flat Table Insert, the beam distribution more closely resembled what may be anticipated from a CyberKnife, whereas now the beam distribution more closely resembles a GammaKnife and, if the planner desires, can use many more beams than available on any GammaKnife platform.

Conclusion(s):

The upgraded Conformal Table Insert permits the treatment planner to take much greater advantage of the unique gyroscopic gantry design of the ZAP-X system. The previous table design was excessively bulky and had a more restrictive collision model that prevented the planning system from utilizing large regions of the solid angle for beam delivery.