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Impact of Gamma Knife Radiosurgery on Reduction of Pain and Medication Requirements in Medically Refractory Trigeminal Neuralgia

Gavin C. Knapp, B.S. - University of Oklahoma Health Sciences Center; Laramie Knapp, B.S. - University of Oklahoma Health Sciences Center; Ozer Algan, MD - OU Health Stephenson Cancer Center; Tyler Gunter, MD - University of Oklahoma Health Sciences Center; Ian Dunn, MD - University of Oklahoma Health Sciences Center; Jerry Jaboin, MD, PhD, MBA, FACRO - University of Oklahoma Health Sciences Center; Phylcia Gawu, DO, MS - University of Oklahoma Health Sciences Center; Shearwood McClelland III, MD - University Hospitals

Objectives: Trigeminal Neuralgia (TN) is a condition characterized by paroxysmal neuropathic facial pain often triggered by common activities such as eating, speaking, or touching the face.¹ Following initial treatment with medication (typically carbamazepine), medically refractory trigeminal neuralgia is debilitating, severely impairing patient quality of life. Of the main surgical interventions for medically refractory trigeminal neuralgia (microvascular decompression, percutaneous radiofrequency rhizotomy, balloon rhizotomy, glycerol rhizotomy), stereotactic radiosurgery (SRS) is the only modality that is noninvasive. We present long-term results of SRS in a population rigorously examined for pain outcome.

Methods: In October 2024, we conducted a retrospective review of patients receiving Gamma Knife stereotactic radiosurgery for medically refractory trigeminal neuralgia at the University of Oklahoma Health Sciences Center from 2015-2024. Patient charts were reviewed for data abstraction. The Barrow Neurological Institute Pain Intensity Score² was used to assess efficacy of treatment.

Results: A total of 35 patients (22 women, 13 men) with adequate follow-up were evaluated. Mean patient age was 67.9 years (median=69 years; range 33-94). Of these patients, 60% (21/35) had right-sided pain, 34% (12/35) had left-sided pain, and 6% (2/35) had bilateral pain. A total of 40% (14/35) of patients experienced pain in the V1 distribution, 77% (27/35) had pain in the V2 distribution, and 66% (23/35) had pain in the V3 distribution. Sixty six percent (23/35) of patients felt pain in multiple branch distributions of the trigeminal nerve. Prior to undergoing Gamma Knife, 46% (16/35) had undergone a previous surgical procedure for trigeminal neuralgia, most commonly microvascular decompression 26% (9/35) and balloon rhizotomy 17% (6/35). The mean follow-up period was 27.5 months (median follow-up = 18 months); the majority of patients were treated to a maximum dose of 85 Gy to the offending trigeminal nerve. At the last follow-up, two patients (6%) were Barrow Class I (no pain, no medications required), 21 (60%) were Barrow Class III (some pain, adequately controlled with medications), 9 (26%) were Barrow Class IV (some pain not adequately controlled with medications), and 3 (9%) were Barrow Class V (severe pain, no relief).

Conclusion(s): In conclusion, a large cohort of medically refractory trigeminal neuralgia patients treated with Gamma Knife stereotactic radiosurgery experienced a long-term improvement in pain, with a minority of patients experiencing a relief from pain and from medication. These results from one of the first radiosurgery series examining pain outcomes using neurosurgery-established criteria firmly establish stereotactic radiosurgery as an efficacious modality in treating medically refractory



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trigeminal neuralgia with the distinguishing feature of being the only treatment modality that is noninvasive.

