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Does the Duration of Gamma Knife Radiosurgery Treatment Affect Outcomes in Trigeminal Neuralgia

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Abstract
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Abstract

Purpose: Trigeminal neuralgia (TN) causes severe facial pain, adversely affecting patients' quality of life. Stereotactic radiosurgery (SRS) using Gamma Knife (GK) is an effective non-surgical treatment. A previous study showed that the SRS dose rate does not affect pain control when patients received an 80 Gray dose. This study aims to determine if the duration of SRS impacts pain relief outcome in TN patients six months after receiving an 82 Gray dose.

Methodology: This is a single-center, IRB-approved, retrospective review of patients with medication-refractory TN who were treated with GK SRS as an initial non-surgical intervention, receiving a dose of 82 Gy between 2018 to 2023. We recorded patients' ages, treatment sites, medications used for pain management, and descriptions of their pain before the GK treatment and six months after the treatment. Statistical analysis was performed using SAS University Edition software.

Results: Between July 2018 and March 2023, 60 cases of TN were treated, six patients who underwent retreatment with GK SRS at 60 Gray were excluded from analysis. The median age at treatment was 69.5 years (range: 30 to 89 years), with 59.3% female and 40.7% male. Of the treated cases, 30 patients had right-sided TN (55.6%) and 24 had left-sided TN (44.4%). Among the 43 patients (79.6%) who returned for their six-month follow-up, 58.1% reported substantial initial pain relief, while 30.2% reported no relief and 11.6% reported varying degrees of partial relief. At follow-up, 20 patients (46.5%) reduced or discontinued their TN medication, while 23 patients (53.5%) did not. None of the patient's seen at 6 months had increased their pain medications. Overall, 69.8% compared to 30.2% of patients reported reduced pain at six months. The average treatment time was 43 minutes (standard deviation: 9.1), with a median of 44.2 minutes (range: 29.6 - 63.8). Chi-square tests showed no significant differences in pain relief, medication reduction, or overall pain reduction at six months ($p > 0.05$). A logistic regression analysis was conducted to compare the clustered median treatment times. The results showed no significant differences in initial pain relief, medication reduction, or overall pain reduction, even after adjusting for age, between the median treatment time of 34.2 minutes (range: 29.6 - 40.4, from July 2018 to March 2020) and the median treatment time of 49.8 minutes (range: 31.8 - 63.8, from March 2021 to March 2023).

Conclusions: The duration of SRS treatment does not impact initial pain relief, medication reduction, or overall pain reduction six months post-treatment. While 69.8% of patients experienced pain reduction, about 53.5% did not change their prescribed medications for TN. Similar to other studies, dose rate and the duration of treatment do not affect GK SRS outcomes for TN pain management.