

Factors affecting Outcome in Frameless Non-Isocentric Stereotactic Radiosurgery for Trigeminal Neuralgia: A Multicentric Cohort Study

Alfredo Conti¹, Carolin Senger², Güliz Acker³, Pantaleo Romanelli⁴, Peter Vajkoczy³

1. University of Messina, Neurosurgery, Messina, Italy
2. Charité Universitätsmedizin, Radiation Oncology, Berlin, Germany
3. Charité Universitätsmedizin Berlin, Department of Neurosurgery, Berlin, Germany
4. CDI Centro Diagnostico Italiano, Neurosurgery, Milan, Italy

Objective(s): Stereotactic radiosurgery (SRS) is an effective treatment modality for trigeminal neuralgia (TN). Nevertheless, a proportion of patients will experience recurrence and about 20% report sensory disturbances. We evaluated predictors of efficacy and safety of image-guided non-isocentric radiosurgery, we determined the impact of trigeminal nerve volume and the nerve dose/volume relationship, together with relevant clinical characteristics.

Methods: 296 procedures were performed in 262 patients in 2 Italian and 1 German CyberKnife centers. In 17 patients the TN was secondary to multiple sclerosis (MS). Trigeminal pain was classified according to the Barrow Neurological Institute (BNI) pain scale. The sensory disturbances were graded according to the BNI hypoesthesia scale. Pain-free intervals were investigated using Kaplan Meier statistics. Univariate and multivariate logistic regression analyses were performed to identify predictors.

Results: Median follow-up was 38 (range 3-117) months; median maximal dose 72.4 Gy; median target volume 25 mm³; median prescription dose 60 Gy (80% isodose line). Actuarial pain control rate (BNI class I-III) at 6, 12, 24, 36, 48, 60 months were 96.8%, 90.9%, 84.2%, 81.4%, 74.2%, 71.2%, respectively. Overall, 18% developed sensory disturbances. Patients with volume above 30mm³ were more likely to maintain pain relief ($p = 0.031$), low integral dose (<1.4mJ) tended to be associated to more pain recurrence than intermediate (1.4-2.7mJ) or high integral dose (>2.7mJ) (low vs. intermediate: log-rank test, $\chi^2 = 5.502$, $p = 0.019$; low vs. high: log-rank test, $\chi^2 = 6.026$ $p = 0.014$). Re-irradiation predicted sensory disturbance ($P < .000$).

Conclusion(s): The ratio of dose to nerve volume may predict recurrence of TN pain and retreatment has a major impact on the development of sensory disturbances after non-isocentric SRS. Interestingly, the integral dose may differ significantly in treatments using apparently similar dose and volume constraints.

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