

# Frameless Image-guided Robotic Radiosurgery for Trigeminal Neuralgia

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## Abstract

**Objectives:** Image-guided Robotic Radiosurgery is an emerging minimally-invasive treatment option for Trigeminal Neuralgia (TN). Our group at CDI(Milan) treated up to date 560 cases and report here the clinical outcomes of 387 treatments with 3 years follow-up. This study represents the largest single-center experience on CyberKnife radiosurgery for the treatment of TN so far reported.

**Methods:** Frameless image-guided robotic radiosurgery was offered to patients with drug-resistant TN, after failure of other treatments or refusal of invasive procedures. A second treatment was offered to patients with poor response after the first treatment or with recurrent pain. Treatment protocol required the non-isocentric delivery of 60 Gy prescribed to the 80% isodose to a 6 mm retrogasserian segment of the affected trigeminal nerve. Retreatments typically received 45 Gy, again prescribed to the 80% isodose. The final plan was developed accordingly to individual anatomy and dose distribution over the trigeminal nerve, gasserian ganglion and brainstem. Clinical outcomes such as pain control and hypoesthesia/numbness have been evaluated after 6,12,24 and 36 months.

**Results:** 527 patients with TN have been treated with CyberKnife radiosurgery at Centro Diagnostico Italiano (CDI), Milan, Italy during a decade (2009-2018). Minimum follow-up of 6 months was available on 496 patients receiving 560 treatments: 435 patients (87.7%) had a single treatment, 60 patients (12.1%) 2 treatments, 1 patient (0.2%) 5 treatments (2 on the right side, 3 on the left side). 443 patients (84%) received the treatment without previous procedures while 84 patients (16%) underwent radiosurgery after the failure of other treatments. A neurovascular conflict was identified in 59% of the patients. 343 patients (receiving a total of 387 treatments) had a minimum of 36 months follow up. Pain relief rate at 6, 12, 18, 24, 30 and 36 months was respectively 92, 87, 87, 82, 78 and 76%. 44 patients out of 343 (12.8%) required a second treatment during the observed period. At 36 months post-treatment, 21 patients (6,1%) reported the presence of bothering facial hypoesthesia. 18 patients out of 21 (85.7%) developed this complication after a repeated treatment.

**Conclusions:** Frameless image-guided robotic radiosurgery in experienced hands is a safe and effective procedure for the treatment of TN, providing excellent pain control rates in absence of major neurological complications. Repeated treatments due to recurrent pain are associated with restored pain control but at the price of a higher rate of sensory complications.

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### Abstract

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