Q&A: Gamma Knife radiosurgery as a treatment for trigeminal neuralgia

Q: What is trigeminal neuralgia?

A: Trigeminal neuralgia is a chronic pain condition of the trigeminal nerve, which supplies feeling to the face. The condition produces intense, shock-like, stabbing pain. In its most severe form, it is so disabling that it has been referred to as the suicide disease.

Q: What role does radiosurgery play in the treatment of trigeminal neuralgia?

A: Patients work with their doctor to determine which of the available treatments is right for them. Treatments include medication, surgery, needle procedures, and radiation. The surgical procedure is called a microvascular decompression, or MVD. It involves the surgical placement of sponge between the blood vessel and the trigeminal nerve. The needle procedure is called a percutaneous stereotactic radiofrequency rhizotomy, or PSR. During this procedure the physician destroys selected trigeminal nerve fibers with a heating current.

Stereotactic radiosurgery is a noninvasive outpatient procedure that uses highly focused radiation beams to alter some of the trigeminal nerve fibers that produce pain. I favor the Gamma Knife system. With the patient's head immobilized in a rigid head frame, the Gamma Knife delivers 192 beams of radiation to the trigeminal nerve. In the weeks after treatment, a lesion (injury) develops where the radiation occurred. Pain relief can occur immediately or over a period of weeks.

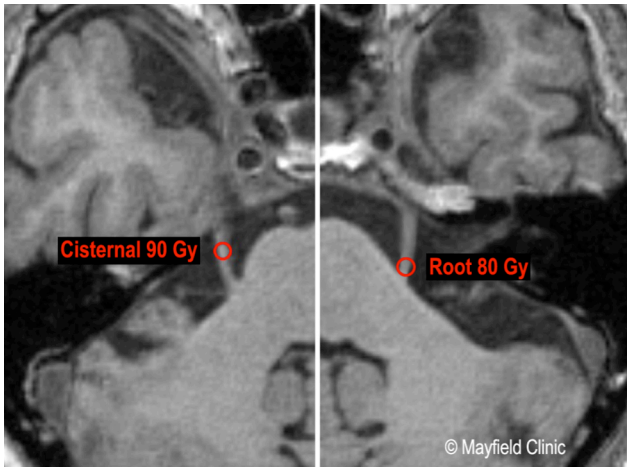
Q: How long has radiosurgery been used to treat trigeminal neuralgia?

A: The first case was performed in 1951. Since then, more than 60,000 patients from around the world have been successfully treated with stereotactic radiosurgery.

Q: Are there any new developments in Gamma Knife treatment?

A: There are two important new developments. The first involves the dose, which is measured in gray (Gy). The word Gray comes from Louis Harold Gray, a British physicist who conducted pioneering research into the measurement of radiation. Since 2014 we have been targeting the trigeminal nerve at a dose of 90 gray. This dose represents an increase from the traditional dose of 80 gray.

Ronald Warnick, MD is a neurosurgeon with Mayfield Brain & Spine and Co-Director of the Gamma Knife Center at The Jewish Hospital – Mercy Health. He has 25 years of experience in radiosurgery and radiotherapy and has performed 3,000 radiosurgery cases during his career. In this Q&A, he explains the role of radiosurgery in the treatment of trigeminal neuralgia, the latest research, and the controversy over how success is defined.



MRI images show two strategies for radiosurgery targeting of the trigeminal nerve.

The second major development involves the procedure itself. At Jewish Hospital, we have implemented the Marseille Technique, an innovative radiosurgery technique for the treatment of trigeminal neuralgia. This technique was popularized by Dr. Jean Regis, Professor of Neurosurgery and head of the Radiosurgery Department at Aix Marseille University in Marseille, France. Dr. Regis has published some of the landmark papers on Gamma Knife radiosurgery for trigeminal neuralgia.

Traditionally, doctors using radiosurgery to treat trigeminal neuralgia have targeted the root entry zone, where the trigeminal nerve enters the brainstem. In the United States, this is the preferred target of the lesion. Several years ago Dr. Regis postulated that targeting the middle of the trigeminal nerve – the cisternal segment – was safer, with less risk of damage to the surrounding sensitive tissue. He postulated further that by targeting this area he could raise the dose from 80 to 90 gray.

In April 2016 Dr. Regis published a paper describing the long-term outcomes of 497 patients treated with Gamma Knife to the cisternal segment of the trigeminal nerve. Early patients in the study were treated with a dose of 80 gray, while later patients were treated with a dose of 90 gray.

Q: What were the results?

A: The study showed the treatment to be safe and effective in the long term in a large number of patients. Of the 497 patients, 92 percent had complete or significant relief from pain at one year; 80 percent at 5 years; and 68 percent at 10 years. The study defines complete or significant pain relief as a score of Grades I, II or IIIa on the Barrow Neurological Institute pain scale. Grade I means the patient has no pain and does not require medication. Grade II means the patient has occasional pain but does not require medication. And Grade IIIa means the patient has no pain but must continue taking medication.
In Dr. Regis's study, the percentage of patients with only the best score of Grade I – no pain and no medications – was 86 percent at one year, 65 percent at 5 years and 45 percent at 10 years.

Q: Is this where the controversy enters in?

A: Yes. The controversy arises over how we define success. And I think radiosurgeons generally have not been explicit about our definition of success. In a perfect world, success would mean a patient is pain free and does not need to take any medications. This outcome – the Holy Grail -- coincides with a score of Grade I. But in the real world, we know that many patients view success differently. They are grateful and consider their procedure a success when they no longer have excruciating pain, when they can get back to work, and when they can move on with their lives. I have been following patients with multiple grading scales, and I have learned that patients will say they are pleased with the procedure and would recommend it again even when they have not reached Grade I. They consider their procedure a success if their outcome is a Grade I through Grade IIIa.

This more practical definition of success – Grades I through IIIa – is what we see in patients all the time. Sometimes patients are still on one medication, and I will ask them, "Has this helped you?" I will never forget the patient who replied, "I was ready to commit suicide, and you brought me from the brink."

At the same time, the rate of success in other treatments for trigeminal neuralgia must be considered by the patient and his or her physician. Both MVD and PSR produce long-lasting freedom from pain in about 80 percent of patients. Together, the patient and physician will decide which treatment path to pursue.

Q: What about facial numbness?

A: In Dr. Regis's study of 497 patients who underwent cisternal targeting of the trigeminal nerve, 20.4 percent experienced facial numbness at 5 years, while "somewhat or very bothersome" facial numbness was experienced in only 2.2 percent. By comparison, facial numbness occurs in less than 5 percent of patients who are treated with MVD. Numbness is the desired outcome in PSR, and it is achieved in virtually 100 percent of patients who undergo this treatment.

Q: Is there any additional research about treatment of trigeminal neuralgia with 90 Gy?

A: In April 2016, the Cleveland Clinic and MidMichigan Medical Center (Midland, Michigan) published the results of Gamma Knife radiosurgery in 870 patients with trigeminal neuralgia. They found that pain relief was better in patients who received the higher dose – 90 gray. The patients in this group also experienced a higher rate of facial numbness. But it is interesting to note that they were treated at the root entry zone of the trigeminal nerve rather than the safer cisternal segment (Marseille Technique).

Q: Are you using the Marseille Technique?

A: We have been using the Marseille Technique since 2014, targeting the cisternal segment of the trigeminal nerve, and we are using the higher dose of 90 gray when possible.

Q: Are you tracking your own patient outcomes at the Gamma Knife Center at The Jewish Hospital?

A: We are tracking patient outcomes using several scales, including the Barrow Neurological Institute pain scale and the Barrow facial numbness scale. We are using the EGFP Scale (excellent, good, fair, poor), and we are also tracking patient satisfaction, asking patients whether they would undergo Gamma Knife again.

Sources & links

If you have questions, please contact Mayfield Brain & Spine at 800-325-7787 or 513-221-1100.

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reviewed by > Ronald Warnick, MD, Mayfield Clinic / University of Cincinnati Department of Neurosurgery, Cincinnati, Ohio