

## THE CYBERKNIFE® SYSTEM OFFERS ALTERNATIVE TREATMENT FOR TRIGEMINAL NEURALGIA

The Hôpital Notre-Dame du CHUM in Montreal, Canada, hosts a monthly clinic for patients with trigeminal neuralgia, a debilitating nerve disorder, that causes “electric” pain in the face. Eating, teeth brushing, shaving or simply a light gust of wind can trigger pain. In 2012, an 89-year-old male patient suffering from trigeminal neuralgia presented to the clinic with pain on the left side of his face. The patient had undergone medical treatment, most recently with oxcarbazepine, which proved ineffective and caused him to be dizzy and unstable when he walked.

### WHO/WHERE

The Hôpital Notre-Dame du CHUM is one of three hospitals that make up Centre Hospitalier de l’Université de Montréal – which is part of a larger university health network in Montreal, Quebec, Canada. The Hôpital Notre-Dame du CHUM provides services such as radiation oncology, organ transplants, neurosurgery, neuro-oncology, urologic oncology and orthopedic surgery. In addition to being a teaching hospital, Hôpital Notre-Dame du CHUM has an emergency room that offers level II trauma care and houses the healthcare system’s gerontology, ophthalmology, nephrology, surgery and psychiatry departments.

### CHALLENGE

Provide non-invasive treatment of trigeminal neuralgia in an elderly patient who was unresponsive to an initial medical treatment. Invasive surgical procedures presented increased health risks due to the patient’s age.

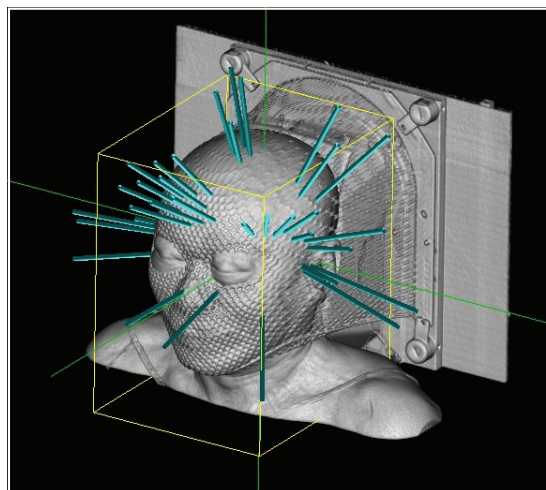
### SOLUTION

The CyberKnife System with Synchrony® Skull Tracking™ (Formerly 6-D Skull Tracking) is a non-invasive treatment that administers a high dose of radiation to a specific target area, limiting exposure to surrounding tissues.

### CYBERKNIFE TREATMENT RATIONALE

While being treated at the clinic, the patient was seen by a radiation oncologist and neurosurgeon to discuss treatment options. According to David Roberge, M.D., head of the department of radiology oncology at Hôpital Notre-Dame du CHUM, options available at the hospital (beyond changes to medication) included microvascular decompression (MVD), percutaneous radiofrequency rhizotomy or radiosurgery using the hospital’s CyberKnife System. Typical surgical risks for any open-skull neurosurgical procedure, such as MVD, include infection, excessive bleeding, spinal fluid leakage and the risks of anesthesia. Percutaneous radiofrequency rhizotomy carries a greater risk of minor to severe post-surgical numbness, and can often be permanent.

In view of the patient’s age and active lifestyle, radiosurgery was preferred because it was the least invasive. Together the patient and physicians determined that the option with the best therapeutic ratio would be radiosurgery using the hospital’s CyberKnife System. “Often, we start with the CyberKnife because it has the least risk involved and the least side effects as well,” Roberge added.

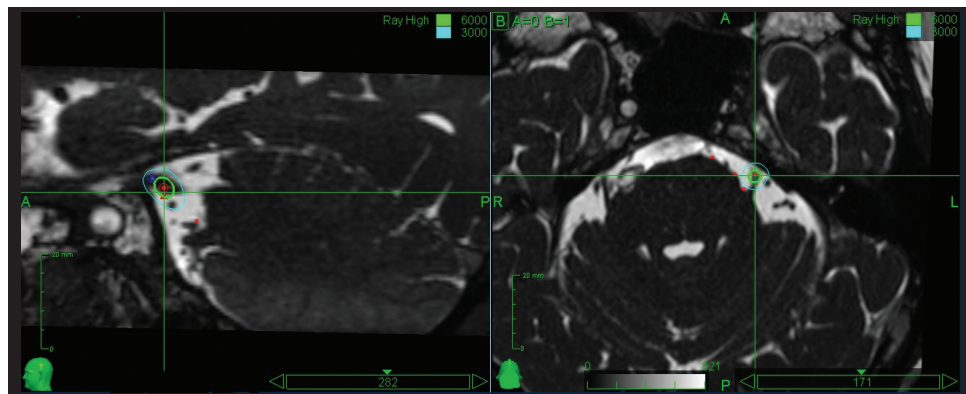


*Non coplanar beam arrangement along the trigeminal path.*

The Hôpital Notre-Dame du CHUM uses the CyberKnife System for treatment of trigeminal neuralgia patients who have failed prior medical or surgical treatments or who cannot tolerate their medication. The non-invasive, outpatient procedure “delivers a single high dose of radiation directly to a short segment of the trigeminal nerve, 2–3 mm from the brainstem,” Dr. Roberge explained.

## THE CYBERKNIFE® SYSTEM OFFERS ALTERNATIVE TREATMENT FOR TRIGEMINAL NEURALGIA

Plan for 80 Gy maximum dose to the left trigeminal nerve.



“The CyberKnife® System provides patients with added comfort when compared with other systems because it does not require that patients, who are already experiencing facial pain, be immobilized using an invasive head frame pinned to the outer surface of their skull.” For the radiosurgery team at Hôpital Notre-Dame du CHUM,

***“the CyberKnife System provides the most straightforward workflow and the greatest targeting assurance compared with other non-invasive systems—giving us confidence that radiation will be delivered to the right target area every time,”*** Roberge said.

### TREATMENT PLANNING

The actual treatment process took place over the course of two days. Once the CyberKnife option was decided, the patient came to the hospital to have his mask made and to undergo a treatment planning MRI and CT scan. After this appointment, the radiation oncologist proceeded with target volume delineation and one of the radiosurgery team’s medical physicists designed a treatment plan using the CyberKnife MultiPlan® Treatment Planning System. The entire team reviewed the plan with the neurosurgeon before the patient returned for treatment. For trigeminal

neuralgia patients, the physicist also performed a patient-specific quality assurance on the CyberKnife System before treatment. “Doing treatment planning on a different day than the treatment delivery gives physicians time to collaborate, review the plan and make necessary changes without the pressure of having a patient waiting for treatment in a head frame,” Dr. Roberge stated.

### TREATMENT DELIVERY

The patient was treated with the CyberKnife System in March 2013. A prescribed dose of 80 Gy was delivered in one fraction—the highest dosage the hospital gives in a single treatment. Synchrony® Skull Tracking™ was used during treatment delivery to track the target area and automatically correct for translational or rotational target shift. The actual radiation delivery took a little more than 15 minutes and the entire process lasted less than 45 minutes from greeting the patient to his departure.

### OUTCOME AND FOLLOW-UP

According to Roberge, no imaging follow-up is required for trigeminal neuralgia patients. After CyberKnife treatment, patients return to the hospital for regular follow-up. They are monitored for pain control and toxicity which could be indicated by facial numbness. Then, medications can be adjusted in partnership with the referring neurologist. The patient returned to the hospital for his first follow-up two months after his treatment and reported that he was completely pain-free. The patient no longer takes medication and remains pain-free to this day.

#### Important Safety Information

Most side effects of radiotherapy, including radiotherapy delivered with Accuray systems, are mild and temporary, often involving fatigue, nausea, and skin irritation. Side effects can be severe, however, leading to pain, alterations in normal body functions (for example, urinary or salivary function), deterioration of quality of life, permanent injury, and even death. Side effects can occur during or shortly after radiation treatment or in the months and years following radiation. The nature and severity of side effects depend on many factors, including the size and location of the treated tumor, the treatment technique (for example, the radiation dose), and the patient’s general medical condition, to name a few. For more details about the side effects of your radiation therapy, and to see if treatment with an Accuray product is right for you, ask your doctor.

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