Leksell Gamma Knife® Icon™ Extends Intracranial Treatment Options

With the ability to perform frameless or frame-based and single session or fractionated treatments within the full spectrum of intracranial indications, Leksell Gamma Knife Icon provides an accurate, safe, comfortable and effective treatment option for patients at Sunway Medical Centre.

Contributors
Dr. Ravi Krishnapillai
Consultant Neurosurgeon
Dr. Heng Siew Ping
Chief Medical Physicist
About

Sunway Medical Centre

Location
Sunway City, Selangor, Malaysia

Equipment and Software
• Leksell Gamma Knife® Icon™ with Leksell GammaPlan®
• Flexitron® brachytherapy afterloading platform with Oncentra® Brachy
• Siemens Magnetom Skyra 3T MRI Scanner
• Varian TrueBeam STx with Eclipse
• INTRABEAM IORT System

Icon Team
5 Clinical Oncologists
6 Neurosurgeons
4 Medical Physicists
6 Radiation Therapists
5 Staff Nurses

Patients
136 Icon patients in the first year of operation

Dr. Ravi Krishnapillai
Consultant Neurosurgeon

Dr. Heng Siew Ping
Chief Medical Physicist
“Leksell Gamma Knife Icon is proving to be a game-changer in the management of brain metastases and other difficult-to-treat lesions.”

Dr. Ravi Krishnapillai, Neurosurgeon

A cancer and radiosurgery center of excellence

Sunway Medical Centre, located in Sunway City, Selangor is one of the largest private hospitals in Malaysia, with a strong reputation for high-quality service. Serving about 500,000 patients from Malaysia and around 30,000 international patients from more than 130 countries every year, Sunway Medical Centre aims to be a leading medical provider in the Association of Southeast Asian Nations (ASEAN) region.

Equipped with some of the latest innovations in cancer treatment, the hospital’s Cancer and Radiosurgery Centre provides patients with a personalized approach to cancer care, focusing on effective treatments for an enhanced quality of life. To help achieve this goal, there is a healthy collaboration between the neurosurgeons and the radiation oncologists at the hospital for all cranial stereotactic radiosurgery (SRS) patients.

In 2017, Sunway Medical Centre added to the Cancer and Radiosurgery Centre’s treatment capabilities with the addition of Leksell Gamma Knife Icon. It is the first facility in Malaysia to offer SRS using Leksell Gamma Knife Icon, with its image guidance and frameless treatment capabilities.

“Gamma Knife surgery is considered the gold standard in stereotactic radiosurgery, which is one of the reasons we wanted this unique technology in our department,” comments Dr. Heng Siew Ping, Chief Medical Physicist. “Its superior dosimetric performance enhances safety and allows for dynamic shaping and more precise sculpting of dose distributions, ensuring that patients receive the highest quality of care.”

Neurosurgeon Dr. Ravi Krishnapillai gained experience with Leksell Gamma Knife® Perfexion™ at a previous hospital before coming to the Sunway Medical Centre. He particularly likes the accuracy and sharp dose fall-off that can be achieved with Gamma Knife surgery and the new capabilities of Icon.

“With over 1 million cases treated since its inception, Leksell Gamma Knife® continues to be the most published modality for brain radiosurgery,” he comments. “Leksell Gamma Knife Icon is an exceptional piece of technology and is proving to be a game-changer in the management of brain metastases and other difficult-to-treat lesions.”
Leksell Gamma Knife System Start is available to all customers with new installations or upgrades of Leksell Gamma Knife. System Start takes place on site in the first week of patient treatments to provide support and enhance skills and competence with the new/upgraded equipment. For new centers, a neurosurgeon and/or radiation oncologist and a physicist consultant provide System Start support. Upgrading centers receive System Start support from a physicist consultant.

**A smooth installation process**

Installation* of Leksell Gamma Knife Icon at Sunway Medical Centre began on August 2, 2017, and was completed by August 11. Elekta provided on-site training and support for the Gamma Knife team for one week, and members of the consultant and radiation oncology team also received training at Gamma Knife centers in Cleveland, Ohio, USA and Marseille, France.

“The installation was a fairly smooth process and the subsequent in-house training was of a very high quality. This involved the on-site presence of Gamma Knife experts in our first week of treating patients, including Ian Paddick, Chief Physicist at the Queen Square Radiosurgery Centre in London, UK. Their contributions were outstanding, and we were extremely grateful for their knowledge and experience as our system went live,” Dr. Krishnapillai recalls.

The first patients were treated using Leksell Gamma Knife Icon at Sunway Medical Centre in November 2017.

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**Gamma Knife Icon capabilities**

Before acquiring Leksell Gamma Knife Icon, cranial radiosurgery patients were treated using linac-based SRS. Between October 2016 and October 2017, 29 cranial SRS cases were treated using a linac. Following installation of Gamma Knife Icon, the hospital’s capacity for treating such cases increased by 369 percent, with 136 patients receiving Gamma Knife surgery between November 2017 and November 2018.

The team at Sunway Medical Centre attributes this steep growth curve to being able to offer treatment for the full spectrum of brain cases. “This technology has given us the ability to treat large brain metastases, residual tumors following surgical resection and otherwise inaccessible targets—such as lesions within the cavernous sinus or brain stem—with extreme accuracy,” Dr. Krishnapillai says.

In addition to traditional frame-based SRS, Gamma Knife Icon allows frameless radiosurgery to be performed using a combination of stereotactic Cone Beam CT (CBCT), a thermoplastic mask system, online dose adaptation and an infrared-based High Definition Motion Management (HDMM) system for patient tracking during treatment. These capabilities of Leksell Gamma Knife Icon ensure high treatment accuracy throughout single session and fractionated deliveries. Sunway Medical Centre has found that fractionation increases the flexibility of Gamma Knife surgery when applied to challenging tumors, including large lesions or those abutting sensitive structures, such as the optic chiasm.
Expanding clinical scope

“The majority of lesions that we currently treat are brain metastases, primarily from lung and breast cancers,” Dr. Krishnapillai says. “In general, for larger metastases we are able to use a mask-based treatment. The frameless capabilities of Leksell Gamma Knife Icon have allowed us to make real headway in the management of patients with large brain metastases (> 50 mm) by using fractionated/staged treatments. This may involve delivering the required dose in three fractions, for example, with three-week intervals between each fraction. By performing this type of fractionated delivery, we are seeing brain metastases literally melt away after Gamma Knife Icon treatment, and we are often able to avoid open surgery.”

“The reliability and reproducibility of Leksell Gamma Knife Icon, together with its quality control and quality assurance programs, enable us to have great confidence in our treatments.”

“Leksell Gamma Knife Icon also gives us confidence to treat functional cases, such as trigeminal neuralgia, due to the high accuracy and the ability to minimize the risk of radiation affecting the brainstem,” Dr. Heng adds. “This allows patients to avoid general anesthesia and surgery, making it a safer and more cost-effective alternative for such patients.”
Case example—fractionated radiosurgery for a large brain metastasis

A 42-year-old female patient, diagnosed with stage 2 left breast cancer in 2013, presented with headache and inability to coordinate her movements in November 2017. An MRI scan revealed a focal brain metastasis in the left posterior, superior parietal occipital lobe, measuring 2.5 x 2.3 x 2.5 cm, with large associated perilesional edema (Figure 1). The treatment of large brain metastases using radiosurgery is challenging due to the need for minimizing toxicity to adjacent tissues while ensuring local tumor control. Gamma Knife Icon allowed this patient to be treated with fractionated radiosurgery, delivering a total dose of 30 Gy at the 50 percent isodose line in three fractions, with an interfraction interval of three weeks.

MRI scans before and after treatment demonstrated significant interval improvement, with a marked reduction in tumor size (Figure 2). Six months after treatment, there was minimal peripheral enhancement in the anterior aspect of the lesion, measuring 4.2 x 2.6 mm, with no significant residual edema.

The patient, who had previously received radiation therapy for breast and liver lesions, spoke about her experience of the Gamma Knife Icon treatment: “I didn’t feel anxious at all during the course of the treatment. I actually fell asleep and did not feel anything. Right after each treatment, I could go home feeling normal and could even drive myself. Not losing my hair and having no wounds or bandages was important to me because it meant that I could carry on with a normal quality of life.”

Figure 1.
Brain MRI scans showing a large metastasis to the left posterior, superior parietal occipital lobe: pretreatment (left) and post-treatment (right)

Figure 2.
Follow-up MRI scans showing marked decrease in size after fractionated radiosurgery
Extending capabilities—now and into the future

Referrals for radiosurgery using Gamma Knife Icon are received internally and externally from neurosurgeons and oncologists. The center has an active ongoing marketing program to raise awareness about the benefits of Gamma Knife technology for patients, physicians and the public. This includes regular talks and seminars for the public and healthcare professionals along with extensive patient awareness campaigns on the web, social media and traditional media platforms.

The center plans to expand its treatment offering to include functional disorders, such as essential tremor, and aims to contribute to the growing published evidence supporting Gamma Knife radiosurgery.

“We are pleased to be pioneering Gamma Knife Icon radiosurgery in Southeast Asia,” Dr. Heng comments. “This technology enables the Sunway Medical Cancer and Radiosurgery Centre to provide patients a long-term clinically proven treatment option that is low risk, cost effective and comfortable,” she adds.

“Leksell Gamma Knife Icon is an important addition to our cancer treatment armamentarium, allowing us to provide a world-class intracranial SRS service to patients in Malaysia and beyond.”

Disclaimер

This customer perspective is based on the experience and application of medical experts, and is intended as an illustration of an innovative use of Elekta solutions. It is not intended to promote or exclude any particular treatment approach to the management of a condition. Any such approach should be determined by a qualified medical practitioner.

It is important to note that radiation treatments, while usually beneficial, may also cause side effects that vary depending on the area being treated along with other medical circumstances. The most frequent side effects are typically temporary and may include, but are not limited to, skin redness and irritation, hair loss, respiratory, digestive, urinary or reproductive system irritation, rib, bone, joint or soft tissue (muscle) pain, fatigue, nausea and vomiting. In some patients, these side effects may be severe. Treatment sessions may also vary in frequency, complexity and duration. Finally, radiation treatments are not appropriate for all cancers, and their use along with the potential benefits and risks should be discussed before treatment.
For almost five decades, Elekta has been a leader in precision radiation medicine.

Our nearly 4,000 employees worldwide are committed to ensuring everyone in the world with cancer has access to—and benefits from—more precise, personalized radiotherapy treatments.