While the ARTISTE linear accelerator solution delivers cutting-edge radiation therapy, patients are soothed by a relaxing atmosphere.

The ART of Cancer Treatment in South Korea

With the help of Siemens ARTISTE and ONCOR Expression linear accelerators for Adaptive Radiation Therapy (ART), the Department of Radiation Oncology at St. Mary's Hospital in Seoul, South Korea, is setting new standards for the care and treatment of cancer patients.

By Edward Targett

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> Jang Hong-seok, Director, Department of Radiation Oncology, St. Mary's Hospital, Catholic Medical Center, Seoul, South Korea

Located in Seocho-gu, St. Mary's Hospital is an oasis of calm in a city not known for tranquility. As the flagship hospital of the Catholic University of Korea's prestigious Catholic Medical Center (CMC) network, which includes eight hospitals across the nation, St. Mary's stands on a site that has been occupied by a CMC hospital since 1980 – but was reborn in March 2009 as a gleaming, modern, 22-story building full of natural light, with an additional six basement floors. St. Mary's has a capacity of 1,200 beds, employs 3,200 professional staff members, and is home to 18 specialist clinical centers. The numbers add up to make it South Korea's largest single-building hospital.

Launched with a cutting-edge, eco-friendly infrastructure and the aim of establishing a new medical culture, the hospital has been working closely with Siemens to see to it that its treatment delivery maximizes patient outcomes and minimizes their discomfort. The hospital's founding vision is to provide a new dimension of world-class medical services based on a profound respect for human life and to regard patients as family.

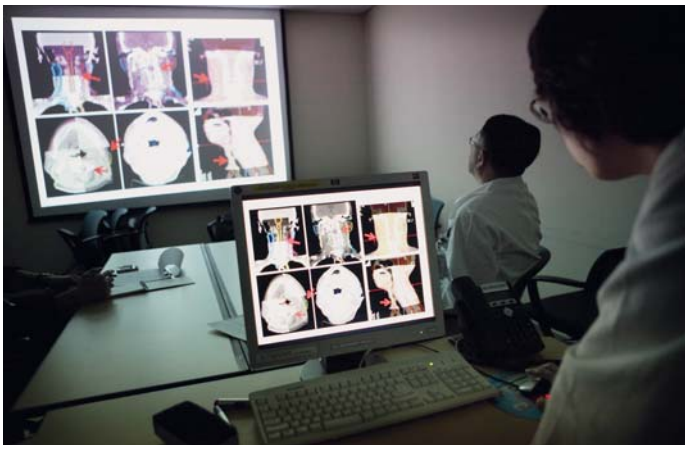
Radiation Oncology Equipment: the Gold Standard

The Department of Radiation Oncology at St. Mary's has been one of the driving forces behind this vision. Headed by Jang Hong-seok, MD, a gastrointestinal specialist who has been with CMC since 1994, the hospital's radiation therapy team treats an average of 150 patients a day from all over South Korea, and increasingly from farther afield as well. "There's a growing national trend in the medical sector to attract patients from other countries, and we are no exception," notes Jang. "We have a lot of American and Russian patients. Some U.S. troops in the country have also been known to fly in family members for treatment. And, we are treating more and more patients from elsewhere in Asia."

Jang, working closely with senior radiation oncologist Kim Yeon-sil, MD, a head and neck specialist, is committed to providing some of the most efficient and accurate treatment options on the market. To that end, the department has been equipped with state-of-the-art Siemens equipment: two ARTISTE™ linear accelerator solutions and one ONCOR™ Expression linear accelerator for cutting-edge cancer treatment, along with the CTVision™ system for in-room computed tomography (CT). Jang and Kim are particularly enthusiastic about the ARTISTE linear accelerator with the groundbreaking CTVision system, which integrates a CT-on-rails scanner with a linear accelerator to bring rapid, high-resolution diagnostic imaging into the treatment vault for true Adaptive Radiation Therapy.

Radiation oncologists use three-dimensional imaging during a course of radiation therapy to improve their ability to conform treatment volume to challenging tumor shapes in vulnerable areas like the spinal cord and optic nerve. The adaptive aspect of ART involves the use of highly tailored computing applications to perform optimization and treatment simulation, or treatment planning. Initial treatment plans – if used alone – are a "snapshot in time" that cannot compensate for developments like shrinkages in tumor size resulting from treatment, movement that takes place in regions such as the lungs during the respiratory cycle, or changes in tumor position






The team of St. Mary's is proud of its top-notch equipment, among them an ARTISTE linear accelerator solution along with the CTVision system for in-room imaging and treatment adaption prior to a treatment session.

"With CTVision, we can change the plan to save a large volume of sensitive tissue."

Kim Yeon-sil, MD, Senior Radiation Oncologist, Department of Radiation Oncology, St. Mary's Hospital, Catholic Medical Center, Seoul, South Korea

because of a different bladder filling. The resulting risk is that healthy tissue can be exposed to harmful and unnecessary radiation while dosage to the tumor itself decreases as a result. In short, both patients and their organs move, which means that the target tumor is also moving.

With the CTVision system, however, clinicians like Kim at St. Mary's Hospital can take CT scans of their patients interfractionally, or between doses of radiation therapy, in order to adapt to significant changes in tumor or patient physiology and create a new treatment plan on the spot. This removes the need for patient repositioning and critically boosts treatment precision. For radiation oncologists and physicians, this means that therapy can genuinely evolve with the patient. "When I treat head and neck or lung cancer patients, I take CTVision images daily for the first week, and then I check with my resident to see how much change there has been or how accurate patient targeting is," says Kim. "I can then change my schedule biweekly or more often. Most interesting for us is that we can actually trace the tumor movement on a daily basis."

Enhanced Patient Comfort Level

The benefits to the patient, adds Jang, can also not be underestimated. Those undergoing radiation therapy are often experiencing significant levels of psychological and emotional stress along with physical discomfort, and the knowledge that they are being treated with a high degree of accuracy can be reassuring. Also, the fact that CT is already in the treatment vault means time savings for both the physician and the patient, since repositioning of the patient on the treatment table is not required.

But the medical professionals and patients both benefit in another, more important way. For radiation oncologists, treatment of tumors around the eye, for example, can be extremely challenging. As Kim points out, "As a head and neck specialist, adapting to changes in patient anatomy is very important. Tumor volume in the head and neck area can change very quickly. An overdose of radiation therapy can cause permanent blindness or loss of vision, especially for risky areas like around the eyes or neuronal tissue. With CTVision, we can change the plan to save a large volume of sensitive tissue." Since many head and neck cancers tend to be extremely radiosensitive, once treatment begins, tumors can shrink daily. Therefore, being able to adapt their treatment plan to such changes in tumor characteristics is of paramount importance for the radiation oncologist. So

when Kim, who has worked for the hospital for the better part of 15 years, talks effusively about working with the CTVision system – which offers what she describes as "beautiful" quality CT in the treatment room – you know she means it. And Jang, alluding to CTVision's SOMATOM® Sensation Open CT, adds, "The resolution of the images is perfect. It provides images with a large field of view at 82 centimeters (32.3 inches) and superb soft-tissue contrast and differentiation." The system can easily be retrofitted to Siemens' whole range of linear accelerators and with patient load capacity up to 550 pounds (250 kilograms) and an 82-centimeter gantry bore, patient access is hardly a problem.

Kim is happy to oblige with case studies. With a practiced hand, she sketches out the tumor change on several images that portray how the ability to easily and rapidly check CT through the CTVision system allows her to minimize exposure to sensitive tissue. "For example, one such case here is a 29-year-old male," she explains. "With an adenoid cystic carcinoma extending to the right cheek, orbit, frontal lobe, right maxillary sinus, and right nasal cavity, this was a very advanced tumor, and we needed to deliver a radiation dose of 72 Gray [Gy] at 33 fractions. I used CTVision daily during the whole course of radiation treatment, so I was able to change his treatment plan several times to save eye structure, reducing dose to the optic nerve and chiasm. And with an elderly female patient who had a small cell carcinoma of the ethmoid sinus which had invaded the eyeball, I was able to change her plan two times at 30 Gray and 50 Gray to reduce radiation dose to the optic nerve and chiasm."

The increased precision of treatment that Kim delineates has shown immediate benefits for the department's workflow, the doctors say. The certainty that accuracy is gold-standard, processing time is unbeatable, and radiation dose to healthy tissue is minimized means that hypofractionation, or the delivery of a treatment course in fewer sessions with an increased dose, is possible. This can mean less disruption to the patient's daily life and also opens up the opportunity for considerable cost and time savings for the hospital – and for more patients to be treated in the same time frame.

It's not a simple matter of business, however. The more time the department gains, the more its physicians can spend on individualized care for their patients. CMC's St. Mary's Hospital in Seoul aims high with its mission statement, but together with Siemens, its goal is becoming reality.

Edward Targett *is a freelance science and healthcare journalist who divides his time between Seoul and London.*

Further Information

www.siemens.com/
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Summary

Challenge:

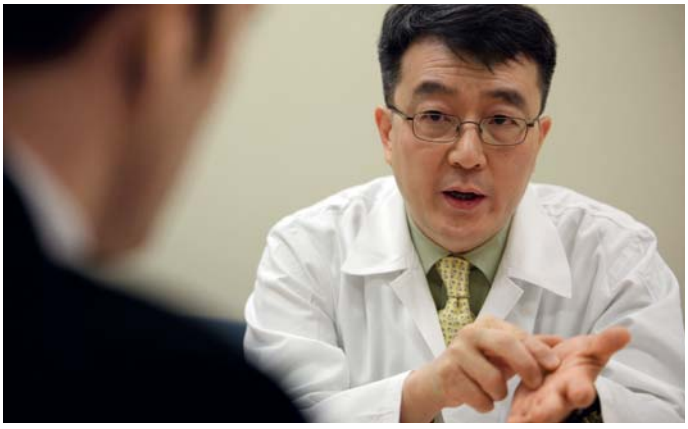
- Delivering efficient and accurate radiation therapy
- Allowing clinicians to replan patient treatment rapidly and with minimum disruption on a daily basis
- Providing increasingly personalized treatment to patients and a seamless departmental workflow
- Optimizing the hospital's cost, time, and space efficiency with future-proof radiation oncology equipment
- Attracting international patients with confidence in world-class cancer treatment and patient care

Solution:

- Adding Siemens ARTISTE and ONCOR Expression linear accelerator solutions with CTVision to make the fighting of cancer fast, focused, and powerful

Result:

- Fully integrated imaging and therapy
- Treatment plans that can evolve with interfractional changes to tumor shape or patient anatomy, increasing the dose to the target area while minimizing radiation to healthy tissue
- Streamlined workflow and increased clinical confidence
- Enhanced comfort and minimal inconvenience for patients



Jang Hong-seok (left) and Kim Yeon-sil (right) appreciate CTVision to adapt patient treatment to changing tumor shape and location.