RapidArc RT
Helping More Patients with Different Types of Cancer

New Cancer Center Shines at Kaiser Permanente

Accelerating ROI with Novalis Tx Radiosurgery Platform
**CONTENTS OCTOBER 2009**

**FEATURES**

**New California Cancer Center Shines** 7

To ensure the quality of care, Kaiser Permanente expands its Northern California network with a new, Varian-equipped cancer center in South San Francisco.

**Clinical Use of RapidArc RT Expands** 10

Clinicians are now treating a broad range of cancer types with RapidArc® radiotherapy technology, Varian’s high-performance solution for volumetric modulated arc therapy (VMAT).

**The Time for Growth** 16

Large academic medical centers and community hospitals alike are investing in the Novalis Tx™ platform to grow a financially healthy radiosurgical service line.

**Point of View** 1

U.S. federal and state government activity is poised to have a tremendous impact on the radiotherapy field, says Dow Wilson, president of Varian’s Oncology Systems business.

On the cover

Odette Pringle was treated for craniopharyngioma with RapidArc radiotherapy technology at the Center for Radiation Therapy of Beverly Hills. See story on page 13.

Photo by Carmel Zucker.

**NEWS**

2  Clinics Deploy RapidArc Technology  From mainland China to North Wales, clinics around the world are employing Varian’s RapidArc technology in cancer treatments.

4  Acuros Capability Clears FDA  Varian has received U.S. FDA 510(k) clearance for the Acuros™ treatment planning capability, which improves the accuracy of dosimetry calculations.

4  IKOE Software Automates Contouring  Varian is now offering a knowledge-based automatic segmentation tool that can accelerate the treatment planning process.

5  RTOG Launches Study of Spine Metastases  The Radiation Therapy Oncology Group has launched a randomized study to test the role of stereotactic radiation for patients with localized spine metastases.

5  SmartConnect Service Now Easier to Access  Varian’s remote service software, SmartConnect®, can now be installed remotely, speeding the set-up process.

6  Varian Adds Education Center in China  In early 2009, Varian began offering courses at its new, fully outfitted training center in Beijing, China.

6  Varian Training Offered in Portuguese  Brazilian Hospital AC Camargo recently partnered with Varian’s education department to offer clinical software training courses in Portuguese.
In the face of a weak global economy, pending healthcare reform legislation in the United States, and threats to Medicare reimbursements for radiotherapy procedures, federal and state government activity is poised to have a tremendous impact on the radiotherapy field. As a result, in July 2008, Varian Medical Systems took a major step forward in becoming more engaged with the legislative and regulatory processes that affect our business and our customers in the United States by establishing a government affairs office in Washington, DC.

Since its inception, the mission of Varian’s government affairs office has been to make U.S. policymakers aware of the lifesaving work that Varian technology enables customers to do across the country, as well as to give the company and our customers a voice in the decisions impacting healthcare policy.

One important function of the government affairs office has been to keep Varian personnel and customers plugged into major legislative efforts that have occurred over the past year. The government affairs office continually works with members of Congress and their staffs, as well as the Department of Health and Human Services and the Centers for Medicare and Medicaid Services, to address physician reimbursement, comparative effectiveness research, health information technology, and many other important issues that impact radiation oncology. By providing lawmakers more insight into how proposed policies could affect patients, Varian helps ensure that the views of the cancer community are considered during this pivotal juncture for our healthcare system.

As the attention of policymakers and the public focuses on reforming the nation’s healthcare delivery system, Varian’s government affairs office strives to keep the company engaged in the debate. As a part of this effort, the government affairs office recently waged a tremendously successful grassroots campaign in response to the Center for Medicare and Medicaid Services’ proposed severe cuts to reimbursement for radiation oncology in freestanding cancer centers. After Varian employees, friends, family, and customers submitted more than 6,800 emails to their members of Congress, more than 60 members of the U.S. House of Representatives sent a letter to the Department of Health and Human Services Secretary, Kathleen Sebelius, in opposition to the proposal. A similar letter from nearly 20 United States senators was sent to Secretary Sebelius.

In addition, as new incentives for health information technology adoption are offered by the government, Varian is actively advocating to ensure that ARIA® software customers are eligible for incentives established by the federal American Reinvestment and Recovery Act (ARRA). This summer, I testified before the Health Information Technology Policy Committee, which makes recommendations to the Department of Health and Human Services regarding certification requirements for electronic medical records (EMRs). Certification will be required in order for EMRs to be eligible for ARRA incentive payments. I discussed the importance of oncology-specific EMRs in the treatment of cancer patients, and how any certification model should allow for EMR software that is specialty specific. The panel reacted positively to my testimony, and understood the importance of adapting any certification model for oncology-specific EMRs.

As vigorous efforts to reform the country’s healthcare delivery system continue to gain momentum, there has never been a more important time for Varian to have strong representation in the U.S. capital. The government affairs office will continue to engage lawmakers and government agencies to ensure that the views of the company, our employees, our customers, and the cancer community are considered throughout the healthcare reform process.
First hospital in mainland China introduces RapidArc treatments

Cancer patients in mainland China are gaining access to fast and efficient radiotherapy treatments with the introduction of RapidArc® technology at the Beijing Cancer Hospital (BCH). BCH is the first hospital in mainland China to introduce RapidArc radiotherapy, which will enable clinicians to offer more advanced care to a greater number of patients.

“The speed and precision of RapidArc make it perfect for the heavy patient throughput that we see in China,” says Guangying Zhu, MD, professor of radiation oncology at BCH. “We will be able to treat more patients with the new RapidArc-equipped accelerator, which should certainly help to improve the regional control rate and offer significant benefits to patients.”

According to Zhu, RapidArc will be particularly helpful in helping to cut growing waiting lists at the hospital, with cancer rates rising significantly year-on-year. “There is a huge difference in the linear accelerator installed base between different areas of China” says Zhu. “From a technology and expertise standpoint, large hospitals in China have advanced equipment and clinical expertise that is no different from that of more developed countries. We just have nowhere near enough capacity to meet our needs.”

There are 12 machines per million people in the United States, and only 0.7 machines per million people in China.

The new system was unveiled at a ribbon-cutting ceremony attended by many local dignitaries in July. Doctors at the hospital intend to use RapidArc primarily for precise treatments of lung cancer, esophagus cancer, rectal cancer, and head and neck cancer.

Beijing Cancer Hospital has treated more than 5,000 patients with conventional IMRT in recent years, gaining a global reputation for the quality of its treatments and the scientific papers published on its research. The department of radiation oncology treats more than 2,000 new cancer patients each year from across China, as well as from neighboring countries such as Vietnam.

Swiss patient treated with RapidArc on Novalis Tx accelerator

Doctors at Inselspital, the Bern University Hospital, have delivered a RapidArc treatment on a Novalis Tx™ platform to treat a patient suffering simultaneous skin cancer of the nose and an aggressive nasopharyngeal cancer with image-guided IMRT. The treatment was “very satisfactory” and compared favorably with conventional treatment techniques, according to Daniel M. Aebersold, MD, Inselspital chairman of radiation oncology. The patient responded well.

“Our first case was particularly challenging due to the fact that two distinct tumor regions were to be treated using different dose prescriptions,” says Aebersold. “The treatment was very quick and we were very impressed by the excellent conformity and good sparing of organs at risk compared to standard IMRT.”

“By delivering advanced RapidArc treatments on a gold-standard platform such as a Novalis Tx, we were able to combine speed with extremely high precision to minimize the possibility of movement during treatment, which is particularly important bearing in mind the larger doses we are using.”

Turkish hospital group selects Varian equipment for major expansion

The first hospital group in Turkey to offer cancer patients advanced RapidArc radiotherapy treatments is acquiring four additional treatment machines from Varian. Acibadem Healthcare Group, based in Istanbul, will expand its radiotherapy facilities in Turkey from three to five when new centers open in Adana and Kayseri later in the summer.

RapidArc treatments have just commenced at Acibadem’s Maslak Hospital in Istanbul, enabling the hospital to extend more advanced care to more patients. Doctors at Maslak are using the technology to carry out image-guided IMRT treatments on a range of tumors.

“Our group continually invests in the latest technology, and we seek to offer the most advanced cancer care in Turkey,” says Enis Ozyar, MD, professor of radiation oncology with Acibadem Healthcare Group. “Having departments equipped by Varian brings tremendous advantages to our group and our patients, because all our centers are integrated and connected and remote access is possible to all planning and patient information systems. It makes it easier for our professionals to deliver treatments by standardizing treatment protocols and plans.”
Acibadem Healthcare Group established its first radiotherapy center in Turkey in 2005, siting two Varian Clinac® linear accelerators in Istanbul Kozyatagi Hospital. A second center equipped with two more Clinac accelerators opened in Bursa last year, while the third—and largest—radiotherapy facility was established at Istanbul’s Maslak Hospital earlier this year, with a Trilogy® unit for radiosurgery, a Clinac accelerator with RapidArc capability, along with a VariSource™ high-dose-rate (HDR) brachytherapy unit. Each site has a suite of Varian’s ARIA® oncology information management software and Eclipse™ treatment planning software.

With the opening of the two new departments in Adana and Kayseri, the sites will match Maslak Hospital with a Trilogy system, a Clinac accelerator, a VariSource unit, and full suites of software. Less than 10 percent of radiotherapy centers in Turkey are able to deliver IMRT. All five hospitals in the Acibadem Healthcare Group will offer IMRT by the end of 2009.

Patients in North Wales gain access to RapidArc treatments

Glan Clywd Hospital will soon offer local cancer patients across North Wales advanced radiotherapy treatments using RapidArc radiotherapy technology on two new treatment machines. When the Clinac linear accelerators with RapidArc are installed, the hospital will become the first in Wales to offer this form of radiotherapy treatment.

The new machines form part of a multimillion-pound initiative to replace aging machines in the hospital, which serves a population of more than 700,000 across North Wales.

“Our current treatment machines have been used continuously since we opened 10 years ago, and they do not allow us to perform the most modern and advanced treatments,” says Jaap Vaarkamp, PhD, head of radiotherapy physics at Glan Clywd Hospital. “The On-Board Imager® device will enable us to treat more precisely, and RapidArc is very exciting because it makes IMRT much quicker to deliver. We are currently only able to use IMRT on one of our machines, so this is a major step forward.”

Nest Bowl, Glan Clywd radiotherapy services manager, says the investment project was given the go-ahead by the Welsh Assembly last year as part of a 10-year strategy to upgrade radiotherapy provision in Wales. Varian equipment was selected after a rigorous tender process. “We are very excited about being able to offer our patients image-guided and RapidArc treatments,” she says. “We already use Varian equipment, so it also makes sense from an interface and training perspective to acquire the latest Varian technology.”

Guatemalan clinic becomes first in Latin America to introduce RapidArc RT

Cancer patients in Guatemala and across Central America now have access to advanced radiotherapy treatments, including IMRT with RapidArc technology. Hope International Centro de Radioterapia has become the first treatment center in Latin America to install a Trilogy linear accelerator outfitted for IGRT and RapidArc radiotherapy.

With RapidArc, clinicians at Hope International Centro de Radioterapia, a new privately funded clinic, can provide more advanced care to a greater number of patients than would be possible with conventional technology.

The new treatment technology was unveiled in September 2009 at an inauguration attended by many local dignitaries, including Alvaro Arzú, mayor of Guatemala City, cabinet-level government officials, medical specialists from across the region, and prominent leaders from the private sector.

“I couldn’t be more pleased with the Varian team that installed the equipment at our new center,” says medical director Luis Linares, MD. “They did a tremendous job, and thanks to their hard work, we were operational in about half the time we thought it would take. Our clinical staff members are all very excited, as they are aware of what this means for cancer patients in the region.”

“It is very gratifying to see the results of so many years of planning and preparation,” says Jorge Sanchez, vice president of Promed, Varian’s partner and distributor in the region since 1998. “This is an important facility for this part of Central America,” continues James Miles, Varian’s director of operations for Latin America and the Caribbean. “We commend Dr. Linares and his team for taking the initiative to provide state-of-the-art cancer care for the people of Guatemala.”
Acuros treatment planning capability clears FDA

Varian has received U.S. FDA 510(k) clearance for the Acuros™ capability, which is being offered initially in its brachytherapy treatment planning system. A significantly more accurate way of calculating the dosimetry of cancer treatments,* Acuros was first introduced at the GEC-ESTRO exhibition in Porto, Portugal, in May of this year.

“This is a quantum leap forward in terms of accuracy, with timeframes that were previously thought unimaginable,” says Sophie Wetherall, Varian BrachyTherapy software product manager. “Acuros offers an improvement in dose calculation that will help clinicians make better decisions about dose to their patients and further their knowledge to make treatments more accurate.”

Dose levels for brachytherapy have generally been calculated as if the sources were surrounded by water, whereas, in reality, a patient’s anatomy contains many different materials such as bone, lung, tissue, and air, as well as additional materials that are often present from inserted applicators. In the past, the only way to account for these variations was using a Monte Carlo calculation technique, something that was only available as a research tool. Now, for the first time in routine clinical brachytherapy, BrachyVision™ Acuros is able to account for the dose effects from these variations.

“BrachyVision Acuros calculation times tend to average between three and eight minutes, depending on the applicator used,” adds Wetherall. “By comparison, the same calculations could take hours or days using the standard Monte Carlo method.”

Acuros, developed by Transpire, Inc., is an optimized, radiotherapy-specific rewrite of the software product Attila, and Varian is working exclusively with Transpire to bring the benefits of this fast and precise calculation method to the radiation oncology field. In so doing, Varian becomes the only brachytherapy supplier with this capability in a commercially available product.

Acuros treatment planning software quickly calculates radiation dose distributions for brachytherapy, taking into account the heterogeneity of tissues and organs.

Acuros, which uses a technique best described as a “grid-based Boltzmann solver” (GBBS), is the most significant additional feature of Varian’s latest brachytherapy treatment planning software offering, BrachyVision 8.8. Varian is now working to integrate the Acuros module into its Eclipse™ product for external beam radiotherapy treatment planning.

* Compared to standard techniques using the American Association of Physicists in Medicine TG43 formalism.

IKOE knowledge-based segmentation automates contouring

Varian is now offering customers a knowledge-based automatic segmentation tool, acquired earlier this year from Houston-based IKOEmed and IKOEtech, that performs automatic contouring of tumors and surrounding anatomy.

The software is designed to achieve greater than 50 percent reduction in the time required for the contouring portion of the radiotherapy treatment planning process. It automates the contouring process by matching patient images with precontoured images from an expert database created by renowned radiation oncologists. This capability eliminates the need for clinicians to manually outline 10 to 20 organs in each of 100 to 200 images of a patient’s disease site.

“This is another important step in our ongoing initiative to make cancer treatments better, faster, easier, and more cost-effective,” says Tim Guertin, president and CEO of Varian Medical Systems. “This new tool should save a lot of time in planning for complex cases, particularly in cancers of the head and neck and lymph systems.” The IKOE software, which has FDA 510(k) clearance, complements Varian’s existing segmentation tools used to automate planning for prostate, breast, and lung treatments.

Varian is offering the software initially in the United States as a standalone product that will work with most radiotherapy treatment planning software products in the industry. The company plans to integrate the software with its market-leading Eclipse™ treatment planning system for radiotherapy, radiosurgery, and brachytherapy.

Four IKOE employees and consultants are being offered jobs with Varian to support the product at Varian facilities in the United States.
RTOG launches study of stereotactic radiation for spine metastases

In August of this year, the Radiation Therapy Oncology Group (RTOG) launched a landmark randomized study, RTOG 0631, testing the role of stereotactic radiation for patients with localized (1–3) spine metastases. Samuel Ryu, MD, radiation oncologist with the Henry Ford Health System, will be serving as principal investigator on this phase II/III study, which will involve a 2:1 randomization between image-guided spine SRS/SBRT (16 Gy delivered in a single fraction) vs. EBRT (8 Gy delivered in a single fraction), the optimal arm of the prior RTOG 9714 study.

According to Benjamin Movas, MD, chairman of the radiation oncology department at Henry Ford Hospital, who is serving as quality-of-life cochair for the study, in RTOG 9714, approximately 50 percent of patients still had significant pain three months after receiving EBRT (8 Gy/1 fraction, which is similar to 30 Gy in 10 fractions). The goal of RTOG 0631 is to see if a higher biological dose (16 Gy in 1 fraction), delivered precisely via SRS/SBRT, will result in a 40 percent relative improvement in pain relief.

Any technology that meets the study QA requirements is allowed. Initially, there is a phase II feasibility component involving a rapid review of SRS/SBRT cases from each institution by Samuel Ryu. This will be followed by a phase III randomized study in which the primary endpoint is pain relief at the treated site (using the numerical pain scale), with quality of life as a key secondary endpoint.

This unique, national randomized study is critical to determine the added value of modern technological strategies in this setting. In addition to Movas and Ryu, other coprincipal investigators for the study are: Peter Gerszten, MD, of the University of Pittsburgh Medical Center (neurosurgery); Fang-Yin, PhD, Duke University Medical Center (physics); Robert D. Timmerman, MD, University of Texas Southwestern (IGRT); Adam Dicker, MD, PhD, Thomas Jefferson University (translational research); and Meihua Wang, PhD, Radiation Therapy Oncology Group/ACR (senior statistician). For more information about RTOG 0631 and other RTOG protocols, visit http://www.rtog.org.  

SmartConnect remote service now easier to access

When customers call Varian’s service representatives, they usually want to know: “How quickly can we resolve this issue?” Since speed is often of the utmost importance, Varian’s service representatives often use SmartConnect® software to link to a customer’s workstation and equipment via the internet. The tool is a handy way to remotely resolve issues, conduct training sessions, or upgrade components of the customer’s hardware and software. Best of all, it alleviates the need for an onsite visit, which, depending on physical distance and travel schedules, could significantly impact a customer’s ability to operate efficiently.

“One of the biggest advantages of SmartConnect is that we can use it to provide immediate service to customers in remote areas—for example, those working in parts of Latin America serviced out of our Miami office,” says Jose Bernazar, Varian customer support manager for Northern Latin America and the Caribbean. “Through the internet, we can connect with customers so they do not have to wait a day or two for us to fly down to help them.”

A new version of the remote connection tool, SmartConnect Now, has been enhanced to expedite service call response times. Previously, installation of the SmartConnect tool sometimes required an onsite visit. SmartConnect Now allows the software to be installed remotely. Customers can initiate the installation process by downloading the software and then navigating through a few basic set-up screens without being asked for technical information. At that point, the customer opens the door for a Varian representative to access the system remotely and complete the installation process within two or three minutes. From that point on, a Varian field engineer can access the system whenever a customer requests assistance.

“The capabilities of SmartConnect remain the same. We are still able to use it to see what the customer sees and resolve the corresponding issue. But now the set-up process is a lot easier and will allow us to respond even faster,” says Dan Dubeau, Varian’s program manager for remote access. “For example, if we need to temporarily take control of an MLC or deliver a service pack or database patch, we can do that in a way that shortens service call times and minimizes a customer’s downtime, which is just what the customer is expecting.”

Current users of SmartConnect can continue using their version of the software, and first-time users can obtain a free copy by calling Varian’s helpline and following the simple downloading instructions. For more information, visit http://www.varian.com/smartconnect.
Varian adds education center in China

Varian has added a fully outfitted training center at its facility in Beijing, China, and began offering courses in early 2009. Modeled after Varian’s highly acclaimed Las Vegas training facility, the Beijing Education Center offers a full range of in-depth courses in a wide variety of disciplines, from radiation therapy and dosimetry to physics and system maintenance. In addition to the treatment vaults, there are two computer labs equipped with 16 ARIA® and Eclipse™ workstations.

Varian partners with Brazilian hospital to offer training in Portuguese

Varian’s education department recently offered an Eclipse™ Operations class in Portuguese for Varian customers in Brazil. The course was conducted at Hospital AC Camargo in São Paulo in July 2009.

“Varian has partnered with AC Camargo clinicians to provide clinical classes at their hospital,” says Sue Merritt, Varian’s senior manager of clinical training for the Americas. “This site is using current technology to provide excellent patient care, on a continent that is gradually deploying the latest treatment solutions.”

The class was offered in Brazil so that customers could avoid the need for getting visas and traveling to the United States. Although many students speak English as a second language, says Merritt, the course was taught in Portuguese because it is easier for learners to understand and assimilate material when instruction is in their native language.

“Varian has partnered with AC Camargo clinicians to provide clinical classes at their hospital,” says Sue Merritt, Varian’s senior manager of clinical training for the Americas. “This site is using current technology to provide excellent patient care, on a continent that is gradually deploying the latest treatment solutions.”

In addition to regularly scheduled courses, such as Eclipse IMRT (RapidArc), On-Board Imager® for the Physicist, and On-Board Imager for the Therapist, special seminars are sometimes held. For example, Varian recently sponsored a special dosimetry seminar for a group of 16 medical physicists from leading cancer hospitals in China. Guest instructors were Fang-Fang Yin, PhD, professor and chief of medical physics at Duke University, and Joseph Ting, PhD, chief medical physicist at the MIMA Cancer Center in Melbourne, Florida. *
New Center Shines in South San Francisco
Kaiser expands its Northern California network to ensure the quality of care

When Kaiser Permanente of Northern California opened a new radiation oncology center in South San Francisco in May 2009, it marked a milestone in its drive to bring cutting-edge radiation treatment in-house. Clinicians at the center expect to treat 1,000 patients a year, including 400 radiosurgery cases, when the center reaches full operation.

The new facility joins a network of four other regional centers opened since 2004—in Santa Clara, Oakland, Roseville, and Rancho Cordova, near Sacramento. Before then, Kaiser outsourced radiation oncology to 21 different independent providers throughout Northern California. “Our patients were served at 21 different centers delivering radiation differently on different equipment,” explains Joseph Song, MD, regional director of radiation oncology services for Kaiser Permanente. “We had no way of controlling the quality. It was like we sent them into a black box.”

Controlling quality is a linchpin of Kaiser Permanente’s approach to managing healthcare. Through an integrated and standardized medical delivery system, Kaiser is able to deliver excellent care at lower costs than many competitors. The organization recently demonstrated the power of integrated delivery with a program that reduced cardiac deaths 73 percent in Colorado. Kaiser’s integrated care delivery system was recently praised by U.S. President Obama in an interview with *Time* magazine. Song believes that bringing radiation oncology within the Kaiser model of integrated delivery will create similar opportunities for improving cancer care in California.
The Northern California network standardized on Varian for its treatment planning, delivery, and record-and-verify systems. In fact, Varian is the standard at Kaiser clinics throughout the United States.

“The primary push for the regional network is to improve the quality and the consistency of the service that we deliver.”

Joseph Song, MD, Kaiser Permanente

Integrating and standardizing

“The primary push for the regional network is to improve the quality and the consistency of the service that we deliver,” says Song. “We can set regional practice guidelines for how to treat diseases. We can also set regional standards on equipment.” The Northern California network standardized on Varian for its treatment planning, delivery, and record-and-verify systems. In fact, Varian is the standard at Kaiser clinics throughout the United States.

All Kaiser Permanente centers in the Northern California region deliver IMRT and IGRT treatments. According to Song, all have or will be upgraded soon with the On-Board Imager® kV imaging system, cone-beam CT, and RapidArc® radiotherapy technology. “The reasons for standardizing on Varian are fairly straightforward,” says Song. “The linear accelerators have the best dose control, the highest dose rate, and best MLC control of any linear accelerators today, hands down. Furthermore, because the beam characteristics are so stable, we are able to match the energies of our linear accelerators between centers.” This consistency has advantages not only within a single center for scheduling flexibility, but also across the network. If need be, patients can be transferred fairly easily between centers. “In California, we have earthquakes. If one center were to be knocked out due to natural disaster, we could care for patients at other centers, probably without having to replan their treatments,” explains Song. “Most centers won’t face this situation, but the issue came up with [hurricane] Katrina.”

Standardizing on technology across the network has other advantages as well. “In my ideal world, I would like staff members from one center to be able to function equally well at all the centers,” says Song, adding that this goal is a work in progress. He envisions a time soon when dosimetrists will be able to work remotely to support any center in the regional network.

Song also wants the new South San Francisco center to participate, along with the other Northern California centers, in regional clinical trials. “We can lend our volume and our weight to trials that we think are important,” says Song. “Our network has emerged in 2009 as one of the top clinical-trial enrolers in North America, with approximately 100 patients a year taking part in trials.” He plans to start enrolling patients in radiosurgery trials for brain, prostate, and lung this year.

It takes a common, shared electronic medical record (EMR) as well as a consistent treatment environment to run clinical trials efficiently. System-wide, Kaiser uses a customized version of Epic as its EMR. The Epic-based EMR and the ARIA® oncology information system run on separate, parallel networks. Exporting images and other data from one to the other is easy with DICOM, and physicians can toggle between the two systems.
on the computers in their offices and the examination rooms. Keeping the networks separate is also a matter of security. If the computer network running the EMR were to be infected with a virus, the treatment network would be completely isolated from the infection.

Shining light on the patient experience

In addition to having the latest technology for planning and delivering radiation treatments, the South San Francisco center shows equally careful attention to the convenience and comfort of patients—starting with the location. For easy access, Kaiser built the center only a few blocks from a major highway. South San Francisco is known for fog, but the first thing patients are likely to notice is the abundance of daylight in the center from large expanses of windows. An atrium garden shielded from the South San Francisco wind is visible and accessible from the lobby. Skylights line the interior halls and mark the entrances to the treatment vaults. All physician offices have windows as well. Patients can’t get lost in the 20,000-square-foot center. They have only two directions to go—right to the exam rooms, or left to the dressing rooms. The nurses’ station is located at the intersection. “This arrangement gives us maximum eyes on the patients as they enter and leave,” explains Song. Visual cues in the carpet and the wall art also help patients find their way. Soft golden walls and natural finishes contribute to a feeling of warmth and serenity.

The treatment vaults are large to prevent patients from feeling closed in and to make movement easy for the therapists as they position patients. The doors have a mechanism for either partial or full closing, which helps to shorten the treatment time for patients. Fully opening and closing the heavy vault doors whenever the therapist enters and exits can add several minutes to a treatment. The vaults are also as quiet as possible; noisy modulators and power conditioners are located in a separate room. The wood flooring and graphic ceiling tiles of the center extend into the vault. Each vault is also identified at the entrance with a large photograph from a California state park.

Continuing to improve care

The carefully planned South San Francisco center is the latest in a growing Northern California network of Kaiser radiation treatment centers. Kaiser Permanente officials plan to expand the network further with two more centers as they pursue their objective of improving the quality and consistency of cancer care.

Profile:
Kaiser Permanente South San Francisco Cancer Care Center

Facility
20,000 square feet
Opened May 2009

Patients treated
External beam radiotherapy: 1,000 per year

Services
IMRT, IGRT, SRS, and SBRT

Varian technology
One Trilogy® linear accelerator for image-guided radiosurgery

Network
System-wide paperless EMR: Customized Epic system

Stereotactic radiosurgery:
300 in the first year
Clinical trial enrollments:
100 per year (for all Kaiser Permanente RT centers)

Two Clinac® iX linear accelerators
On-Board Imager® kV imaging system
RapidArc® radiotherapy technology
Eclipse™ treatment planning system
ARIA® oncology information system
Clinical use of RapidArc RT expands

Clinicians use RapidArc radiotherapy technology to treat broad range of cancer types
Since its introduction two years ago, Varian’s RapidArc® radiotherapy technology has been deployed at more than 170 cancer centers around the world. Clinicians are now using RapidArc, Varian’s technology for volumetric modulated arc therapy, to treat a wide spectrum of cancer types.

RapidArc technology delivers an image-guided, intensity-modulated treatment with one or more arcs of the linear accelerator gantry around the patient. During a treatment, the RapidArc software varies three parameters simultaneously—the MLC aperture shape, the dose rate, and the speed of gantry rotation—to arrive at the prescribed dose distribution. Many treatments can be completed with just one rotation of the machine; some of the more complex treatments require multiple rotations. For complex or for radiosurgical treatments, RapidArc can be delivered in multiple arcs, or with couch rotations for noncoplanar treatments.

This article highlights some examples of how clinicians are taking advantage of RapidArc technology to provide patients with fast, accurate, conformal treatments.

Head and neck cancer

At Cancer Care of Western New York, Dhiren Shah, MD, used RapidArc to treat a case of cancer that had started in his patient’s tonsil and spread to the lymph nodes. His clinical team compared a RapidArc treatment plan with one for conventional IMRT and found that the RapidArc plan spared more of the patient’s salivary glands, as well as the rest of his oral cavity. Yet the “beam-on” time for the RapidArc treatments was less than two minutes. “Prior forms of radiation therapy might have severely compromised his salivary function,” says Shah. “With RapidArc treatments, we have a good chance of avoiding or minimizing these kinds of debilitating side effects.”

James Rembert, MD, radiation oncologist at the Alta Bates Summit Comprehensive Cancer Center in Berkeley, California, agrees. He recently used RapidArc technology to treat a tumor that was right behind his patient’s larynx. “The larynx moves when you swallow,” says Rembert. “A person can go a minute or two without swallowing, but not a whole lot more than that. So RapidArc allows us to deliver better treatments for tumors that move with swallowing.”

Doctors at Chang Gung Memorial Hospital in Taiwan began RapidArc treatments in February of this year, and by August they had treated more than 300 patients, the majority with head and neck cancers. “Our experience is that the dose distribution
with RapidArc is easily equivalent to the best seven-field IMRT treatments, but the beam delivery time is less than three minutes,” says Ji-Hong Hong, MD, director of the hospital’s department of radiation oncology. “In particular, the sparing of the parotid glands and other important organs such as the brain stem is excellent.

“We have long waiting lists, and we are now able to treat five patients per hour with RapidArc, including beam-on time and setup. The clinicians benefit because we don’t have to compromise the field angle due to long delivery time, while the patients feel far more comfortable during the treatment course.”

**Prostate cancer**

The first prostate cancer patient to receive RapidArc treatments at the New Mexico Cancer Center in Albuquerque happened to be midway through a course of conventional image-guided IMRT when the RapidArc technology was installed. Doctors switched him over. “The RapidArc treatments went by so fast!” he notes. “Before then my treatments were taking 20 minutes, and I was finding that very stressful. When the process dropped to 90 seconds per treatment, I hardly had any time to think—it was over so quickly.”

Such impressions are typical of patients who experience both conventional IMRT and RapidArc radiotherapy treatments. At the Northwood Cancer Center near Houston, Texas, radiation oncologist Christopher Phan points out that, by decreasing the time it takes to deliver treatment, you not only make your patients more comfortable, you minimize the chance of any voluntary or involuntary movements during a treatment. “RapidArc is fast enough to reduce the chance of dose delivery error due to tumor motion,” he says. “Further, our prostate cancer treatment plan comparisons show that, dosimetrically, the RapidArc plans are often better than the traditional IMRT plans in sparing the healthy tissue around the tumor.”

**Brain tumors**

Amsterdam’s VU Medical Center was one of the first hospitals in the world to implement RapidArc clinically, and its use for the treatment of brain metastases has become routine. To date, more than 40 patients have received whole brain radiotherapy with integrated boost for up to five brain metastases.

“After conventional brain radiotherapy to patients with multiple brain metastases, nearly half of them will experience a brain recurrence within six months,” explains Suresh Senan, PhD, professor of clinical experimental radiotherapy. “That is our reason for administering whole brain irradiation with an integrated boost using RapidArc, delivering 4 Gy in five fractions to the whole brain, while the metastases receive an 8-Gy boost at each treatment. By treating the whole brain with a simultaneous integrated boost, you achieve far better dose distribution than if both treatments are delivered sequentially.” This work has been published in the Red Journal.*

Doctors at the Oncology Institute of Southern Switzerland (IOSI) in Bellinzona were among the first to pioneer a sophisticated brain tumor treatment using RapidArc technology, and found that it offered considerable advantages over previously used techniques.

A 22-year-old woman with a medulloblastoma, the most common brain tumor in young people, received two separate single arcs to account for a 75-cm treatment field. One arc covered the brain and cervical vertebrae; the second covered the spinal cord. Each of the 25 fractions took just 70 seconds for the first arc and 60 seconds for the second. With imaging and setup, the patient was on the couch for just 15 minutes.

“Before RapidArc we would have had to treat with two lateral opposite fields for the brain and one for the spine,” says Antonella Fogliata, PhD, the institute’s head of physics. “These two settings needed to be matched at the point of the cervical vertebrae, basically the middle of the neck. This meant a risk of hotspots at the matching line, with the possibility of paralysis in the worst case.

“The two RapidArc fields overlapped by about 5 mm, meaning there was no need to match the lines and no need to create second plans with moving isocenters to avoid hotspots. We were able to protect all the organs at risk and the patient was on the couch for far less time, with less chance of movement.”

**Craniopharyngioma**

At the Center for Radiation Therapy of Beverly Hills in Southern California, Christopher Rose, MD, characterized another complex, two-arc RapidArc case as “one of the most interesting uses of noncoplanar arcs I have seen so far.” His patient was Odette Pringle (pictured below and on the cover of this issue of Centerline), a 47-year-old woman with a large craniopharyngioma, a tumor arising in or near the pituitary gland. The tumor was adhering to the undersurface of the optic chiasm and growing all around it. A neurosurgeon had been able to dissect out most of the tumor, which was 6 cm in diameter, using a frontal approach, but the surgeon was unable to remove some abnormal calcified epithelial cysts adjacent to and behind the chiasm.

Rose’s team merged the pre- and postoperative MRIs with the planning CT scan in order to treat the residual volume as well as those CNS surfaces that had been involved with craniopharyngioma preoperatively. “We contoured the optic nerves, optic chiasm, and optic radiations,” Rose explains, “and put in a dose constraint that the daily dose to those structures and to other normal neural tissue could not be greater than 1.8 Gy per day.”

In addition, the prescription specified that at least 95 percent of the PTV needed to get 100 percent of the dose. “We expanded the craniopharyngioma CTV target by 3 mm since we were using the Trilogy® face mask and bite block immobilization system for the treatment and we had never seen movement greater than 3 millimeters in similar cases with the infrared tracking,” Rose says. “I had always wanted to use two orthogonal arcs to
treat a patient like this—a standard brow rotation with extreme neck flexion to miss the eyes and then a sagittal arc to treat in a cranio-caudal orientation between the eyes. The planning was incredibly easy, the optimization of these two arcs worked like a charm, and after running the partial arc to treat the sagittal orientation two or three times on a phantom, the whole team gained confidence.”

According to Rose, the treatment plan was “incredibly conformal,” with the maximum dose within the PTV volume 6 percent higher than the prescription dose. “None of the normal neural tissue within the invaginations of the PTV received more than 1.8 Gy per day,” says Rose. “The medial temporal lobes received a maximum of 50 percent of the PTV dose, and the frontal lobes received only 30 percent of maximum dose. The dose was higher than the 45-to-50.4 Gy dose in the literature, and the normal tissue dose was much less. And even with the need to go into the room to rotate the treatment couch 90 degrees for the sagittal arc, the entire treatment—including daily imaging—took less than 10 minutes!”

**Lung cancer**

In addition to their clinical work treating brain tumors, doctors at Amsterdam’s VU Medical Center are also pioneering RapidArc treatments for lung tumors. Their stereotactic treatments for early stage lung tumors, details of which have been published in *Radiotherapy and Oncology*, began last year.* Professor Suresh Senan and his team are now routinely treating three lung cancer patients a week with RapidArc.

“The average delivery time using our standard noncoplanar beams was previously around 15 minutes for these complex cases, but nearly a third of patients required an additional set-up procedure during delivery as a consequence of intrafraction shift,” says Senan. “With RapidArc, we have reduced delivery times to between 4.5 and 11 minutes, depending on the risk-adapted fractionation scheme used. We hope to reduce treatment times further to less than six minutes for all cases by the end of this year.”

The additional savings in time will come about using Varian’s Novalis Tx™ accelerator, which delivers up to 1,000 monitor units (MU), combined with the recent RapidArc upgrade that places no restrictions on the number of MUs delivered per arc. “These improvements have put clear blue water between Varian’s system and rival solutions, as delivery times of between 22 and 100 minutes have been quoted by others for this indication in recent publications,” says Senan.

“We are also pleased with the highly conformal plans achieved with RapidArc, which allow us to further reduce doses to critical structures like the chest wall, especially for nonspherical tumors,” Senan adds. “Even larger tumors are now being treated, and our patients appreciate the ability to complete their entire session quickly.”

Ben Slotman, MD, chairman of the hospital’s department of radiation oncology, adds, “We have reported excellent results with lung stereotactic radiotherapy previously, but RapidArc has now allowed for improvements in departmental efficiency, and cone-beam CT-guided setup on the tumor ensures that we are treating the tumors accurately.”

**Pediatric Hodgkin’s lymphoma**

Doctors at the Oncology Institute of Southern Switzerland in Bellinzona have also now treated pediatric Hodgkin’s lymphoma using RapidArc radiotherapy. A 12-year-old girl received a two-arc treatment in 150 seconds with good sparing of organs at risk such as heart, breast, and kidneys. “These treatments are difficult because the child must lie still. She would normally have been put to sleep, but with RapidArc we were able to avoid the toxicity

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of anaesthesia and we were very pleased with the outcome,” says physicist Antonella Fogliata.

Elsewhere in Switzerland, at the University Hospital of Zurich (USZ), clinicians have used RapidArc to successfully treat an 80-year-old male patient with skull non-Hodgkin’s lymphoma lesions. After a single arc treatment that took 72 seconds to deliver, the effect on the patient was described as “impressive” by the clinical team. “At the start of treatment, the patient had bumps on his head which were painful because they were stretching the skin on the skull,” says assistant professor Gabriela Studer, PhD. “After several fractions there was a substantial shrinkage of the tumors.”

Jan Hrbacek, scientific collaborator at USZ, adds, “The key target in such a treatment is to avoid the brain. For that, we devised the tangential fields technique achievable by using RapidArc. As the gantry rotates around the patient’s head, the MLC leaf aperture adjusts to deliver the most dose in a tangential direction to the skull skin, maximizing the sparing of the brain tissue. RapidArc is a very effective way of achieving this.”

Bladder cancer

In April of this year, a 72-year-old bladder cancer patient received the first RapidArc treatment delivered in India, at the Yashoda Cancer Institute in Hyderabad.

“We have seen better dose sparing by using RapidArc, reducing toxicity, and better dose homogeneity to the target that could improve disease control.”

Marta Scorsetti, MD, Institute Humanitas

Chilikuri says speed is particularly important because of the large number of cancer patients in India. “In a country like ours with a heavy cancer burden, there is a real issue with waiting lists. We deal with this by prioritizing and optimizing treatment facilities, and RapidArc is an excellent example of this approach,” he says. “With this [approach], we can carry out faster and more precise treatments with less complex delivery and less complicated quality assurance requirements.

“The whole point of acquiring RapidArc was to treat more and more patients with high-precision technology,” Chilikuri adds. “With RapidArc’s fast and efficient treatment delivery, we will significantly increase the number of patients treated with advanced conformal techniques.”

Abdominal lymph nodes

Finally, at the Institute Humanitas in Milan, Italy, doctors are publishing a paper on their pioneering work treating abdominal lymph nodes in less than three minutes, using two arcs. This is about seven minutes quicker than previous techniques based on IMRT delivered using multiple fixed beam angles. Eight patients have been treated using this stereotactic body radiotherapy technique to date.

“We have seen better dose sparing by using RapidArc, reducing toxicity, and better dose homogeneity to the target that could improve disease control,” says Marta Scorsetti, MD, head of radiation oncology at Humanitas. According to Scorsetti, the RapidArc planning optimization is quite simple, due to the cylindrical symmetry of the abdominal lymph metastases, usually requiring less than 30 minutes if the arcs are optimized together, making RapidArc “the technique of choice.”
GROWING a financially viable radiation oncology service has never been more challenging. The world over, hospitals and clinics struggle to provide affordable care without exhausting their resources. In the United States, the flight of investors from tax-exempt bonds, the shrinking of even the most conservative institutional investment portfolios, the decline in philanthropic contributions, and the reductions in reimbursements have caused some medical institutions to reexamine their priorities and defer needed projects.

At a time when new capital equipment expenditures come under intense scrutiny, the value of the Novalis Tx® radiosurgery platform stands out. Large academic medical centers and community hospitals alike are investing in the versatile Novalis Tx platform to grow a financially healthy radiosurgical service line.

Radiosurgery uses a large dose of radiation to eliminate tumors and other lesions. Because radiosurgery is noninvasive, it can be easier, less costly, and have fewer side effects than open surgery in some instances. And where open surgery is not an option, radiosurgery can extend and save lives. The first generation of radiosurgery systems could treat only the brain, and only the largest hospitals could justify their cost. Novalis Tx changes that. Novalis Tx is an advanced, image-guided radiosurgery platform for the treatment of sites in both the brain and body. However, when it isn't being used as a dedicated radiosurgery device, Novalis Tx can also be used to deliver precise radiation therapy, including RapidArc® radiotherapy treatments.

In addition to the product suite’s many clinical advantages for physicians and patients, the versatility of Novalis Tx makes it economically possible for community hospitals as well as large cancer care centers to grow a radiosurgery program that matches the best in the world. Novalis Tx accelerates a clinic’s return on investment (ROI) in many ways.

COST MANAGEMENT

In the United States, with healthcare costs rising at a double-digit rate, providers are increasingly under pressure to rein in spending.

The issue of rising healthcare costs was a key factor in the decision at the Henry Ford Health System of Detroit, Michigan, to acquire the Novalis Tx technology. What technology do we really need? Which radiation unit will ultimately benefit the most patients? These are the critical questions Henry Ford clinicians asked themselves, recalls Benjamin Movsas, MD, chair of the department of radiation oncology. “Novalis Tx is among the most flexible and versatile systems on the market,” says Movsas. “It allows you to switch between the more common treatment options—3D CRT or IMRT, for example—and the most complex options, stereotactic radiosurgery or stereotactic body radiotherapy.”
No one can accurately predict the ratio of different treatment strategies needed at any particular site, maintains Movas. “The Novalis Tx makes it unnecessary to buy a separate, dedicated stereotactic unit, yet provides the highest quality of image-guided stereotactic treatment available,” he says. “It’s a very cost-efficient and clever way of approaching the issue, and it gives us the best of both worlds.”

**NEW SERVICE**

The unique flexibility of the multipurpose Novalis Tx has enabled community hospitals and clinics to add radiosurgery as a new service line and revenue stream.

Residents of Dover, New Hampshire, no longer have to travel to other cities for radiosurgery. They can be treated locally at the Seacoast Cancer Center at Wentworth Douglass Hospital. When the radiation oncology department needed to replace an aging medical linear accelerator, the cancer center seized the opportunity provided by Novalis Tx to add radiosurgery to their program of comprehensive cancer care. This new service is part of the hospital’s strategic plan for growth. “Novalis Tx makes it possible for us to develop a new program and receive referrals that truly represent incremental new business to us,” says Ellen Caillé, vice president of physician services. “These are patients that we would not otherwise see at our hospital.”

**RETAINED REVENUE**

Novalis Tx makes it feasible for many community treatment centers and hospitals to retain revenue from treatments in-house that otherwise would be lost with referrals to other providers. That was one reason why the Palo Alto Medical Foundation (PAMF) acquired the system. “Radiosurgery is an expensive treatment and a lot of funds were flowing out of the facility because we had to refer out patients,” explains Gordon Ray, MD, chairman of radiation oncology at PAMF. “We decided to create the service in-house because it made good sense from both a patient care and business perspective. Offering a radiosurgery program allows us to control the overall patient care from beginning to end and provide more personalized patient care.”

**A BROADER MARKET**

The horizons for radiosurgery are expanding significantly through ongoing research into radiosurgery’s use in the treatment of prostate, breast, lung, and other cancers. The demand for stereotactic body radiotherapy (SBRT), delivered in one or a few sessions, is potentially many times larger than that for brain radiosurgery.

“According to our model, the population of extracranial cases treatable with radiosurgery outnumbers intracranial cases three to one in our area,” says Diane Cassels, executive administrator of the radiation oncology department at the Emory Clinic. The Emory Clinic is expanding its radiosurgery practice with Novalis Tx based on its analysis of the evident need. “The providers in our area are capturing only about 18 percent of the total treatable market for radiosurgery,” says Cassels.

Novalis Tx positions centers to perform intracranial radiosurgeries today and to build up an SBRT and radiotherapy program over time as the demand increases. “In midsized markets or where a hospital can’t afford a standalone stereotactic program, Novalis Tx provides a good opportunity to put in a machine that can do both brain and stereotactic body treatments, as well as conventional radiation therapy,” says Greg Spurlock, executive vice president of US Radiosurgery, a company that designs, builds, and operates radiosurgery facilities for partner physician practices and hospitals. Because Novalis Tx is a multipurpose treatment platform, institutions can balance radiosurgery and radiation therapy treatments according to their business plans.
DONOR SATISFACTION

The Novalis Tx increases the potential for donor satisfaction—an advantage in times when philanthropic donations may decline. The Palo Alto Medical Foundation recently received a gift of US$1.5 million toward the acquisition of a Novalis Tx radiosurgery platform, enabling the clinic to start a radiosurgery program. “On our list of needs, Novalis Tx was the one that gratified the donor’s philanthropic inclination. Her major interest was in providing a new service with the greatest potential to improve lives and advance the treatment of cancer,” says Gordon Ray of PAMF. “We had a strong business plan, and the gift made it easier for the business affairs committee to support the project.”

REPUTATION FOR LEADERSHIP

A reputation for comprehensive care or advanced technology draws patients.

That is why the physician partners of Gemeinschaftspraxis for Radiotherapy and Radiation Oncology in Munich, Germany, invested in Novalis Tx for their private clinic. “There are 20 linacs providing radiation therapy in the Munich area, so we have to offer something special,” explains partner Heinrich Schorer, MD. “Novalis Tx puts us on the cutting edge, so we stand out for innovation.” Conventional conformal therapy and IMRT will support radiosurgery, which is reimbursed at a lower rate than radiation therapy in Germany.

Wentworth Douglass Hospital in Dover, New Hampshire, has a reputation for providing the latest advances in cancer treatment. “We were convinced that radiosurgery is where the industry is going, and we wanted to have a leadership role as a community hospital. Novalis Tx gives us that opportunity,” says Wentworth Douglass vice president Ellen Caille.

RAPID ROI

Every provider needs to make its own analysis, but hospitals and treatment centers of varying sizes are finding that Novalis Tx shows a return on investment very quickly. “We calculated we would see a return on our investment for the radiosurgery add-on components (the Varian HD120 multileaf collimator and the BrainLAB Exac-Trac®) of the Novalis Tx system in less than three years, based conservatively on treating two new radiosurgery cases per week,” says Larry Ponce, director of New Hampshire’s Seacoast Cancer Center. Whether an institution is focused on cost management, new services, or broader markets, growing a radiosurgery program with Novalis Tx can make sense.

Nancy Heifferon is a freelance healthcare writer.

Dollars and sense:
Six reasons to choose Novalis Tx

The Novalis Tx radiosurgery platform enables your facility to:

1. Tap an underserved market for stereotactic body radiotherapy in your catchment area.
2. Acquire new patients by providing the most advanced treatment available closer to home.
3. Stop referring radiosurgery patients elsewhere and retain the revenue.
4. Maximize revenue by increasing system utilization.
5. Reduce capital investment risk by receiving a mix of both radiosurgery (SRS) and radiation therapy (IMRT) reimbursement rates.
6. Offer effective treatment to previously untreatable tumors and conditions.
Varian and BrainLAB joined forces with one aim: to make noninvasive radiosurgery available to more patients. The result is a suite of products for radiosurgery called Novalis Tx™, with the power and precision to treat not just the brain but also the spine and tumors of the body.

- The powerful radiation beam reaches tumors that were previously too small or deep-seated to treat.
- The high-definition HD120 multileaf collimator sculpts the beam to the exact contours of the target.
- Not just one, but three imaging systems robotically position the patient and aim the radiation beam to millimeter accuracy.
- Frameless cranial immobilization gives physicians the flexibility to treat in one session or a few sessions, allowing treatment for larger targets previously untreatable.
- Beam “gating” technologies now allow moving targets like lung tumors to be treated.
- Intelligent software simplifies treatment planning for surgeons, oncologists, and physicists.

Around the world, medical centers are finding that these clinical and technological advantages, and more, make the Novalis Tx radiosurgery platform a logical financial choice to form the heart of a growing radiosurgical and radiation therapy practice.
RapidArc for SBRT
Simply Revolutionary

Stereotactic body radiation therapy (SBRT) is a technique where high doses of radiation are precisely delivered from many directions to a focused target. This results in an ablative treatment with curative intent, and spares surrounding critical structures.

RapidArc® radiotherapy technology delivers sophisticated SBRT treatments faster than previously possible, and opens up new treatment options for your patients.

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