

Medical Solutions

For the daily and trade press

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Background information Radiation: Therapy

The field of oncology addresses both the study and the treatment of malignant tumors. Over the years, effective tumor control has been demonstrated by the use of surgery, drugs (chemotherapy), and radiation therapy. Approximately 60% of all cancer patients will receive radiation therapy as a part of their treatment.

Technology

The objective of radiation therapy – also known as radiation oncology or radiotherapy – is to irradiate and destroy tumor cells, while sparing the surrounding unaffected tissues and critical organs from excessive radiation. As treatment delivery techniques become more exacting, the practice of radiation oncology is becoming highly dependent upon the use of imaging. Prior to planning the treatment, physicians known as oncologists make use of the most modern imaging techniques available. Among these are Magnetic Resonance (MR), Computed Tomography (CT), Positron Emission Tomography (PET), combination PET/CT, or Single Photon Emission Computed Tomography (SPECT). Radiation is successful in the treatment of many different cancers, but not all kinds. The tumors that respond best to radiation treatment are said to be “radiosensitive”; in these tumors the cancer cells multiply faster than normal, which results in rapid tumor growth. When the cells that make up these tumors are treated, the radiation penetrates the cell and changes it through a transfer of energy so that the cell is no longer capable of division or repairing the damage that has been done. This results in cellular death. Sometimes the normal tissues surrounding the tumor are also irradiated. As long as the delivered radiation dose does not get too high, the normal tissues will be able to repair themselves.

Treatment

The linear accelerator (linac) is the equipment most commonly used to provide modern radiation therapy treatments. The linac is capable of producing two different types of radiation, X-rays (also known as photons) and electrons. X-rays are produced by electrons that are carried by a wave of traveling radio-frequency (RF) along an accelerating waveguide. At the end of the waveguide, the electrons exit the structure to strike a target and produce a clinically usable beam of X-rays. If the objective is to treat with electrons, the target is removed from the beam's path, with a clinically usable electron beam as the result.

The overall radiation dose is prescribed by a radiation oncologist, a physician who is specially trained in the use of ionizing radiation for treating cancer, and he or she will decide if the patient requires treatment with X-rays or electrons. The radiation oncologist works closely with a medical physicist to develop an individualized treatment plan that shows the location of the tumor and sensitive organs within the patient, as well as the planned location of the radiation treatment. Correct delivery of the treatment is dependent upon exact positioning of the tumor on the treatment table. In the control area of the treatment rooms, a radiological technician (also known as a radiation therapist or therapy radiographer) ensures that the correct type of energy is selected for treatment, along with the correct energy and dose.

As treatment delivery techniques become more precise, the use of imaging is playing a more important role in radiation therapy. Not only are high-quality diagnostic images used to plan the treatment, but the use of devices such as an Electronic Portal Imaging Device (EPID) on the linac or a CT scanner in the treatment rooms is now considered by most clinicians to be necessary, to ensure that the tumor is in the correct position for treatment. Siemens Oncology Care Systems Group has identified Adaptive Radiation Therapy (ART) as the future of radiation treatment management and delivery. ART will enable clinicians to make necessary adjustments to the patient set-up, the treatment plan, or the treatment dose as needed, in order to provide the best possible outcome for the patient.

History

Siemens began manufacturing linear accelerators for delivery of radiation therapy in Walnut Creek, California in 1974. In 1987, the first fully digital linear accelerator, the MEVATRON™-2 series, was introduced. The success of this product mandated the move to a large manufacturing facility in the neighboring city of Concord. Siemens was recognized as a pioneer in the advanced treatment technique of Intensity-Modulated Radiation Therapy (IMRT) with the introduction of the PRIMUS® family of linear accelerators in 1996. IMRT provides a method for “wrapping” a tumor with a radiation dose, thereby lessening side effects that can occur when normal tissues surrounding the tumor are irradiated.

Long established as an innovation and technology leader in radiation therapy, Siemens continues to manufacture linear accelerators in its Concord facility. But those linacs are only a part of the Oncology Workflow Solutions™ that Siemens has become known for. These solutions include both hardware and software solutions, as demonstrated by the new ONCOR™ Linear Accelerator and the *syngo*®-based COHERENCE® Oncology Workspaces. Designed to work together to improve quality while containing costs, COHERENCE and ONCOR are the flagship products of Siemens Oncology Care.

Press images of the ONCOR Linear Accelerator are available for downloading in the Internet under: <http://www.siemens.com/med-bild/Oncor>.

Siemens Medical Solutions is one of the world’s largest suppliers to the healthcare industry. The company is known for bringing together innovative medical technologies, healthcare information systems, management consulting, and support services, to help customers achieve tangible, sustainable, clinical and financial outcomes. From imaging systems for diagnosis, to therapy equipment for treatment, to molecular medicine to hearing instruments and beyond, Siemens innovations contribute to the health and well-being of people across the globe, while improving operational efficiencies and optimizing workflow in hospitals, clinics, home health agencies, and doctors' offices. Recent acquisitions in the area of in-vitro diagnostics – such as Diagnostic Products Corporation – mark a significant milestone for Siemens as it becomes the first full service diagnostics company. Employing approximately 36,000 people worldwide and operating in more than 130 countries, Siemens Medical Solutions reported sales of 8.23 billion EUR, orders of 9.33 billion EUR and group profit of 1,06 billion EUR for fiscal 2006 (preliminary figures). Further information can be found under: <http://www.siemens.com/medical>