Experts Discuss Potential For Radiosurgical Technique To Treat Cancer

Radiosurgical approaches to cancer treatment are showing promise in the treatment of lung, liver, and spinal tumors, according to four leading clinical experts who presented at a symposium in New York earlier this month. New approaches to image-guidance and motion management are making it possible to successfully target tumors that are typically hard to reach with a radiosurgical technique doctors call stereotactic body radiotherapy (SBRT).

"Evidence has shown that increasing the dose to the targeted tumor improves local control or survival, while reducing the dose to normal surrounding tissues reduces treatment toxicity of treatment," said John J. Kresl, M.D., Ph.D., medical director of Radiation Oncologists of Central Arizona at Banner Good Samaritan Medical Center. "This is precisely what stereotactic body radiotherapy enables us to do so well. In the past, outcomes for radiation therapy weren't as good as we hoped for, because side effects prevented us from making the dose high enough to control the cancer. By enabling us to minimize exposure of the normal healthy tissues, stereotactic treatments are helping to overcome this problem."

Radiosurgical treatments involve the use of numerous small, powerful, highly focused radiation beams to attack tumors from many different angles in just one to five sessions. Conventional radiotherapy approaches involve delivering smaller daily doses over 30 to 40 treatment sessions.

Collectively, the four speakers at the symposium have treated over 3,800 patients with SBRT or SRS using linac technology.

Treating Lung Cancer Robert Timmerman, M.D., of the University of Texas Southwestern Medical Center, presented findings from RTOG 0236, a recent multi-center study of SBRT in the treatment of medically inoperable lung cancer patients. At three years post-treatment, the rate of overall survival for these study patients was 56 percent, as compared with historical survival rates of 30 to 50 percent for similar patients treated with conventional radiation, Dr. Timmerman said, referencing an article he and a group of coauthors published last month in the *Journal of the American Medical Association (JAMA)*(1). In addition, the primary tumor control rate, which means that there was no recurrence of the tumor that was treated, was extremely high—97.6 percent at three years post-treatment. "That is more than double the rate of primary tumor control achieved in earlier studies where conventional radiotherapy was used," Timmerman said.

"On the strength of these results with inoperable lung cancer patients coupled with recently completed trials using sublobar resection for high-risk patients, the National Institutes of Health have approved a concept for a phase III randomized

trial comparing this surgical approach to SBRT for high risk operable patients," Dr. Timmerman said. Sublobar resection refers to a limited form of surgery that removes only a portion of the involved lobe rather than the entire lobe.

Treating Spinal Metastases Yoshiya (Josh) Yamada, MD, with Memorial Sloan-Kettering Cancer Center of New York, talked about the role of radiosurgery in managing spine metastases—a type of cancer that is often very painful. "Spine radiosurgery is extremely effective for patients who do not have any spinal compression. We are able to deliver these treatments safely and significant complications are rare. The literature consistently shows local control rates of up to 85 percent for these patients, and they often experience near complete pain relief. The majority of patients feel a significant improvement in pain within about ten days of radiosurgery," he said.(2,3)

Treating Tumors of the Liver Tumors of the liver can be very difficult to treat with radiotherapy, said Martin Fuss, M.D., professor of radiation medicine at the Oregon Health and Science University in Portland. By injecting and staining tumors with an iodine-rich oil, he can see them more clearly with image-guidance tools. This enables him to concentrate high doses in tumors while achieving a sharper reduction in dose to tissue around the tumor.

Dr. Fuss uses IMRT and the RapidArc™ delivery technique on the Novalis Tx™ system from Varian and BrainLAB to deliver SBRT treatments for liver tumors. "With RapidArc, we can deliver a complex SBRT treatment in less than ten minutes, using technology that gives us 600 MU of dose delivery per minute," he said. "With new machines that can deliver up to 2400 MU per minute, treatment durations will fall even further. That might make it feasible to use a breathhold technique, rather than gating or abdominal compression, to control respiratory motion during a treatment."

The one-year overall survival rate for liver cancer patients treated with SBRT at OHSU stands at about 60 percent. For the patients whose liver function was well-preserved at the time of treatment, the one-year overall survival rate was nearly 85 percent.(4,5) "I still follow patients I treated three years ago," he said. "For people with liver cancer, that's significant."

Technology Developments Behind the Trend "Technological developments have allowed for the much broader use of stereotactic radiosurgery (SRS) for tumors of the brain and spine, and stereotactic body radiotherapy (SBRT) for tumors elsewhere in the body," said Dr. Kresl, who has now completed these procedures for disease sites including the skull base, head and neck, spine, lung, liver, kidney, pancreas, bone, prostate, and metastatic or recurrent tumors in many sites of the body. "The driving force behind this trend is technology—important advances in hardware, software, and imaging tools that make it possible to identify targets accurately and precisely, deliver high doses to these targets and simultaneously limit or reduce the dose being delivered to surrounding normal tissues and structures."

More than 200 radiation oncology professionals attended the symposium, which was sponsored by The Institute for Medical Education and supported by an

unrestricted educational grant from Varian Medical Systems (VAR).

The Institute for Medical Education (IME), one of the largest continuing medical education providers in the country, is a fully accredited medical communication and education company devoted exclusively to designing, developing, and implementing quality continuing medical education conferences and programs that are in compliance with standards of the California Medical Association and the Accreditation Council for Continuing Medical Education. IME is accredited by the Institute for Medical Quality/California Medical Association (IMQ/CMA) to provide continuing medical education for physicians. The IME takes responsibility for the content, quality and scientific integrity of its programs.

(1) Timmerman et al. Stereotactic Body Radiation Therapy for Inoperable Early Stage Lung Cancer JAMA.2010; 303: 1070-1076. (2) Yamada Y, et al. High-dose, single fraction image-guided intensity-modulated radiotherapy for metastatic spinal lesions. Int J Radiat Oncol Biol Phys 2008;71:484–490. (3) Gerszten PC, Mendel E, Yamada Y. Radiotherapy and radiosurgery for metastatic spine disease: what are the options, indications, and outcomes? Spine 2009: Oct 15;34(22 Suppl):S78-92. Review. (4) Fuss M, Thomas CR Jr. Stereotactic body radiation therapy: an ablative treatment option for primary and secondary liver tumors. Ann Surg Oncol. 2004 Feb;11(2):130-8. Review. (5) G. V. Walker, T. L. McDonald, J. Schwartz, W. Naugler, K. Kolbeck, J. Kaufman, K. G. Billingsley, S. Orloff, M. Fuss. Outcomes of stereotactic body radiation therapy (SBRT) and hypofractionated radiation therapy (HFxRT) for hepatocellular carcinoma (HCC). Poster presented at the American Society of Clinical Oncology's 2010 Gastrointestinal Cancers Symposium, Saturday, January 23, 2010.

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