Targeting tumors with pinpoint accuracy

by JO GILES

It's hard enough to hit a stationary target…so imagine the difficulty of hitting a moving one. That's a daily challenge for doctors who treat tumors located on organs in the abdominal area. The slightest movements, such as coughing or breathing, can shift the tumor.

But with the Calypso 4D Localization system, doctors can continuously target prostate tumors, sparing surrounding healthy tissue.

It's a global positioning system for the body.

During a procedure, similar to a prostate biopsy, transponder beacons are placed in three locations in the prostate. The beacons act like a GPS inside the body.

Once treatment begins, the room lights are dimmed as green laser lights align the patient's body. Then, the Calypso system fine tunes the prostate's internal position.

It uses sensors to monitor the prostate's position in real time, transmitting information 10 times a second. The data allows physicians to adjust treatment to target the tumor.

Doctors who treat prostate cancer at UNMC said the equipment is revolutionizing care by providing pinpoint accuracy.

"It gives actual coordinates of where the prostate is located," said Charles Enke, M.D., chairman of the radiation oncology department. "Results of ultrasound, CT scans and X-ray images tend to be more subjective because, unlike Calypso, they require human interpretation."

Dr. Enke is so impressed with the results that he is leading a team of researchers to expand the use of Calypso on other cancers such as pancreatic cancer.

Chi Lin, M.D., a UNMC assistant professor, will examine the feasibility and efficacy of stereotactic radiotherapy in patients with hepatocellular carcinoma.

Because breathing also causes liver tumors to move, the Calypso system will be used to target and track tumor motion during radiation therapy to achieve further treatment gains. Dr. Enke said this will improve the accuracy and delivery of radiation doses for abdominal organs that move.

To support that research effort, UNMC and its hospital partner, The Nebraska Medical Center, will install a second Calypso machine.

As one of five sites in the United States to test its original use, Dr. Enke participated with a team of researchers in the clinical trials phase before the Food and Drug Administration cleared it for approval. The Nebraska Medical Center was the first hospital in the United States to purchase the system following FDA clearance.

"This offers a technology that eliminates uncertainty," Dr. Enke said.

The system also allows doctors to use "dose painting," which allows the highest risk areas within the prostate to receive the greatest dose radiation. Dr. Enke said this could be used to treat other types of cancer such as lung, breast and liver.

But that's not the only tool at Dr. Enke's disposal.

Another radiation therapy device, Novalis Stereotactic System, targets tumors by delivering a single dose to a small area. The Novalis system, too, offers patients precise treatment.

"We use it for smaller targets such as tumors in the brain, tumors adjacent to the spinal cord or tumors that involve areas near the eyes or sinuses," Dr. Enke said.

While both systems represent different types of technology, they are being used in a synergistic fashion to improve patient outcomes.

Because of the GPS advantage of the Calypso localization system, Dr. Enke said it will become the treatment standard for prostate radiation targeting at The Nebraska Medical Center.

"It's exciting to use motion control," Dr. Enke said. "The accuracy we can offer patients is life-changing."

With Calypso, Dr. Enke hits his target every time.

Dr. Charles Enke and his team plan to expand the use of Calypso for pancreatic cancer. Craig Keller, radiation therapist, prepares a patient for treatment.