

END-TO-END

QUALITY ASSURANCE FOR STEREOTACTIC RADIOSURGERY

by Jack Borgo



Radiation oncology is a field governed by the minute. Fractions of a millimeter are often all that separate invasive material from critical structures. Small disparities in radiation dose can mean the difference between treatment success and clinical error.

The Standard Imaging Lucy 3D QA phantom mounted on the precision leveling and rotational alignment base stimulates patient positioning for frameless cranial or body SRS. The 3-D geometry of the patient setup can be examined throughout.

These exacting standards have led doctors, dosimetrists and medical physicists to demand superior performance from themselves and their equipment. This self-policing is particularly important during stereotactic radiosurgery (SRS) because the primary sources of regulation are internal checks.

“For some, SRS is a new modality that they haven’t done before,” Southeast Missouri Hospital’s Chief Physicist Dr. Sam Hancock said. “And in an unfamiliar process, it’s possible to get a step wrong unless you have some kind of independent check to see if you did something incorrect.”

For Dr. Hancock, whose center has achieved accreditation in radiation therapy by the American College of Radiology, this independent check is Standard Imaging’s Lucy Phantom — a spherical, Lucite phantom designed to provide quality assurance for each step of SRS.

“At the time, there were no commercially available tools that I was aware of for doing a test of the entire radiosurgery process,” Dr. Hancock said. “So when I saw the Lucy phantom on display, I could immediately see its potential for people like me — medical physicists responsible for

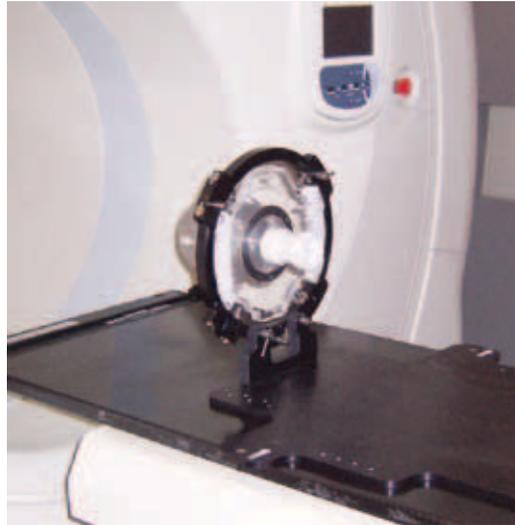
radiosurgery. It was the only option I found that could provide a true end-to-end test of radiosurgery accuracy addressing both frame-based and frameless image-guided localization.”

During the coming years, Dr. Hancock worked with Standard Imaging’s engineers to refine Lucy into a tool that would meet, and eventually exceed, his initial expectations. According to Dr. Hancock, this collaboration helped turn Lucy into the ideal SRS phantom, whose multitude of inserts and ability to lock into most commercial head frames made it highly adaptable.

“Physicists can test every single step in the chain of steps during the SRS process but still not know how it all fits together and if the end result is what you intended,” Dr. Hancock said. “With Lucy, you can start with an MRI scan and go through all the steps of CT scan, image fusion, localization, treatment planning, export to the treatment machine, positioning and delivery and see if you get the spatial and dosimetric accuracy you want. That’s really the only way to have assurance that the whole process is working.”

Standard Imaging product manager Neal Miller points to the Lucy 3D QA phantom as an example of a product that improves department safety by meeting the exacting guidelines stressed by doctors like Dr. Hancock.

“We go to great lengths to ensure that all our products are held to highest standards, and we won’t sacrifice precision,” Miller said. “This demand doesn’t only come from in-house. Our customers, whether it’s a medical physicist or dosimetrist, demand devices that perform flawlessly in a clinical setting. They realize what’s at stake, and they aren’t willing to take risks. The Lucy embodies this. Every aspect is manufactured within 0.1mm tolerance, and we don’t know of another phantom that can claim that kind of accuracy.”



The Lucy 3D QA Phantom positioned on a TomoTherapy couch using a Varian/Radionics/CRW/BRW frame

While neither Miller nor Dr. Hancock claim that the Lucy alone can foster a flawless SRS treatment, both believe that their calculated collaboration has produced a product that can stave off clinical errors.

“As news reports of misadministration come out and our managers ask, ‘Could this happen to us?’ I point out that before we treated our first patient, we had independent verification of the spatial and dosimetric accuracy of our process,” Dr. Hancock said. “Then I say, we have the Lucy phantom, and at regular intervals, I do an end-to-end test

to demonstrate that our treatments are still being done as accurately as they were in the beginning.”

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