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Robotic Tracking May Save Time, Reduce Radiation Dose Exposure in CT-Guided Procedures

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By Mike Bassett

The use of robotic tracking can save time and reduce radiation dose exposure to both patients and interventional radiologists during CT-guided percutaneous bone procedures, according to research presented Monday at RSNA 2017.

There are several advantages to using robotic systems in CT-guided procedures, according to researcher Simone Quarchioni, MD, of the Department of Biotechnological and Applied Clinical Sciences, University of L'Aquila, Italy.

Simone Quarchioni, MD, presented research on the use of robotic tracking systems in CT-guided procedures.

"First, there is the possibility of reducing radiation dose exposure, which is particularly valuable in case the procedures are performed on young patients," he said. "There is also the possibility of reduced procedure times that will be useful in children and/or uncooperative patients."

Robotic tracking systems can also help interventional radiologists control needle trajectories, thereby avoiding structures near the lesion and possibly reducing side effects, since the technique eliminates the need to change the direction of the needle inside the patient's body.

The system, starting with a CT scan, reconstructs 3-D models of a patient's anatomy. Then, with the use of infrared technology, the system is capable of recognizing the spatial position of microspheres reflecting infrared beams that are positioned on the interventional tool. This allows the interventional radiologist to follow the needle inside the patient's body using real-time navigation.

In this study, Dr. Quarchioni and colleagues performed 38 CT-guided percutaneous bone procedures (18 biopsies, 10 crioablations, and 10 radiofrequency ablations) between January 2015 and December 2016.

Nineteen of the procedures (nine biopsies, five crioablations, and five radiofrequency ablations) were performed using a robotic tracking system, while the other 19 procedures (nine biopsies, five crioablations and five radiofrequency ablations) were performed with the standard "freehand" technique.

The final positioning of the needle was confirmed by CT fluoroscopy in all procedures. The researchers confirmed the robotic tracking system correctly positioned the needle in the patients with a single entry in 95 percent of the cases (18 out of 19 procedures). The one case in which the needle needed to be repositioned was due to an error of 4 millimeters.

The mean execution time for those procedures that were assisted by the robotic system was 16 minutes, compared to 25 minutes for the standard freehand techniques. The mean radiation dose for patients after the first CT scan was performed to detect the lesion was 3.5 mSv ± 1mSv with the traditional freehand technique compared to 0.92 mSv ± 0.78 mSv with the robotic-assisted procedures.

The radiation dose for the interventional radiologists during the robotic-assisted procedure was zero.

The major take-home message from the study is that the robotic tracking system reduces procedure times and radiation dose to both patients and interventional radiologists, Dr. Quarchioni said.

"The system also allows rapid, accurate centering, even of small lesions, reducing side effects and technical failure, with the consequent reduction of the operators' learning curve," he added.

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