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Virtual reality enables real-time, internal view of patient anatomy during treatment

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Immersive virtual reality (VR) may enable interventional radiologists to improve treatments using real-time 3-D images from inside a patient's blood vessels. New research presented today at the Society of Interventional Radiology's 2019 Annual Scientific Meeting shows that the interactive technology could provide faster, more efficient treatment, with less radiation exposure and greater precision, ease and confidence.

"Virtual reality will change how we look at a patient's anatomy during an IR treatment," said Wayne Monsky, MD, Ph.D., a professor of radiology at the University of Washington and lead author of the study. "This technology will allow physicians to travel inside a patient's body instead of relying solely on 2-D, black and white images."

The purpose of the study is to demonstrate the feasibility of using a catheter with electromagnetic sensors projected onto a VR headset to see and steer the catheter through the anatomy to certain blood vessels.

Using a CT angiography scan, researchers created a 3-D printed model and a holographic image of blood vessels in a patient's abdomen and pelvis. Monksy's team of radiologists guided hi-tech catheters through the 3-D printed model while the tracking system showed the image from the catheter through the VR headset. They compared the time taken to steer the catheter from the entry point of the femoral artery to three different targeted vessels versus the time the process took using conventional fluoroscopic guidance, as well as time taken in similar real-life clinical angiographic procedures.

In 18 simulated procedures, researchers found the mean time to reach the three targeted vessels using VR was much lower than in fluoroscopy, the standard practice that uses an X-ray image. In the first vessel, virtual reality took 17.6 seconds versus 70.3 seconds using the standard practice on the model and 171.2 seconds in the real-life procedure.

With the improved efficiency, the researchers believe VR technology will create safer treatments by reducing the amount of radiation exposure to both patient and physician. They say it would also increase access to IR treatments.

"Currently, the life-saving potential of IR is limited to hospitals and areas with the resources to invest in image-guided technology," said Monsky. "There are 3 billion people worldwide in rural areas who don't have this access. This technology could allow for portability and accessibility so that these procedures are brought to rural areas using nothing more than a suitcase."

Researchers also surveyed the practitioners who had tried the technology, and they reported that VR improved the ease, precision and efficiency of the treatment. Additionally, the users said they felt more confident in their abilities.

The VR software was developed through a University of Washington business incubator that supported development of a startup, Pyrus Medical, of which Dr. Monsky serves as the chief medical officer. The researchers are continuing to conduct research in 3-D models, as well as animal studies, as they begin the regulatory process to apply for approval from the Food and Drug Administration.

More information: Abstract 294: Virtual Reality (VR), dynamic holographic, display of the vascular anatomy and a co-registered angiographic catheter with electromagnetic (EM) tracking for the

guidance of endovascular procedures. A pilot phantom study to evaluate the feasibility of angiography-free endovascular procedures. W. Monsky; R. James; S. Seslar. University of Washington Medical Center, Seattle, WA; University of Washington, Seattle, WA. SIR Annual Scientific Meeting, March 23-28, 2019. www.sirmeeting.org/

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