Lung cancer clinical trial finds lung function without additional imaging

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A newly NIH funded clinical trial (NCT02528942) by University of Colorado Cancer Center investigators and collaborators at Beaumont Health in Michigan and the University of Texas Medical Branch is evaluating a new method for pinpointing and sparing healthy lung tissue during lung cancer radiotherapy. The group is applying advanced image analysis techniques to 4D CT scans already performed as a standard step in targeting lung cancer radiotherapy, to map areas of lung function without additional testing.

"We used to treat the lungs as a homogenous organ, as if all areas were equally important. Now we know that's not true - there's regionally variant function. The idea of this clinical trial is to spare functional portions of the lung during radiation by using this new imaging modality to display lung function," says Yevgeniy Vinogradskiy, PhD, CU Cancer Center investigator and assistant professor in the Department of Radiation Oncology at the CU School of Medicine.

The challenge starts with the fact that lung tumors move along with a patient's breath, making any single image of the tumor's position imprecise for much of the breathing cycle. In the past, with static imaging, this meant using crude approximations to account for a patients ' breathing motion during radiation therapy.

The answer to this challenge was 4D CT, which was developed in the early 2000s. 4D CT uses a series of images shot over time to capture the position of the lung and the tumor during all phases of the breathing

cycle (time being the fourth dimension in "4D CT"). Most lung cancer patients undergo 4D CT as standard-of-care to help radiation oncologists develop a personalized plan to account for breathing motion during therapy.

While 4D CT shows tumor movement, it has not shown the function of surrounding lung tissue. Until now. The current clinical trial uses information of air movement from existing 4D CT data and "some equations," says Vinogradskiy (diplomatically) to calculate lung function in tissue surrounding tumors.

The idea is then to take the lung function information calculated by this new imaging and use advanced radiation delivery techniques to spare the parts of the lung used for breathing. By sparing functional portions of the lung the researchers aim to significantly improve quality of life for patients that have undergone radiation treatment.

"One of the neat things about it is there's no extra procedure required for patients. All of the lung function information used to optimize the radiation treatment plan comes from imaging that is already acquired as part of standard of care," says Vinogradskiy.

The current clinical trial will enroll 70 patients, finishing in three years.

"We've demonstrated that the concept works in retrospective studies but this is really the first step in integrating the novel imaging and treatment prospectively in patients. From here, we hope to show compelling results that could lead to a national clinical trial. It's still very early, but this system has the potential to become the standard way that radiation therapy treatments are done in lung cancer patients," Vinogradskiy says.

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