Image-processing algorithm reduces CT radiation dose by as much as 95 percent

July 20 2010

Perfusion CT scanning, an emerging imaging technology, got a bad rap last year when a machine set to incorrect radiation levels overdosed hundreds of people in Los Angeles. In the wake of this incident, researchers at the Mayo Clinic, excited by the technology's promise for diagnosing stroke, cancer, and possibly heart disease, have developed a way to reduce the amount of radiation involved in the procedure -- which, when done properly, already involves very little risk.

"At the correct dose, there should be no injury," said Cynthia McCollough. "We believe in the clinical value of perfusion CT, so we're trying to lower the dose and reduce the stigma."

McCollough and her colleagues created a new image-processing algorithm that can give radiologists all of the information they need using as up to 20 times less radiation, depending on the diagnostic application. The research will be presented at the 52nd Annual Meeting of the American Association of Physicists in Medicine (AAPM) in Philadelphia.

A typical CT perfusion procedure lasts about half a minute and scans the same tissue many times, each scan at a low dose. These scans both reveal the internal anatomy of the patient and show how levels of a contrast agent, such as iodine injected into the bloodstream, change of over time. Changing concentrations of iodine can be used to calculate blood volume and flow in order to detect injuries to blood vessels or tumor responses to treatment.

The new adaptive algorithm compares these 20-30 scans and can differentiate between anatomical regions that do not change from moment to moment and those regions that carry the contrast agent --effectively reducing image noise while preserving iodine signal. The quality of each scan improves through non-linear comparisons with scans acquired earlier and later in the exam.

"When we use very low doses, the noise gets so high that it's hard to tell what you are seeing," said Juan Carlos Ramirez Giraldo. "With this algorithm, we're trying to maintain both the image quality, so that a doctor can recognize the anatomic structures, and the functional information, which is conveyed by analyzing the flow of the contrast agent over the many low dose scans."

At the AAPM meeting, the researchers will present animal data showing the effectiveness of the technique. They have also begun to process data from clinical brain perfusion CT exams in patients.

"We're up to 15 or 20 cases that we've shown to the docs, and they're all giving us the thumbs up," said McCollough.

The presentation "20-Fold Dose Reduction Using a Gradient Adaptive Bilateral Filter: Demonstration Using in Vivo Animal Perfusion CT" by J Ramirez Giraldo et al. will be at 7:30 a.m. on Tuesday, July 20 in room 201B of the Philadelphia Convention Center.

More information: ABSTRACT: http://www.aapm.org/meetings/amos2/pdf/49-12884-22113-304.pdf

Provided by American Institute of Physics