Virtual imaging trials optimize CT, radiography for coronavirus disease (COVID-19)
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An open-access article in ARRS' *American Journal of Roentgenology (AJR)* established a foundation for the use of virtual imaging trials in effective assessment and optimization of CT and radiography acquisitions and analysis tools to help manage the coronavirus disease (COVID-19) pandemic.

Virtual imaging trials have two main components—representative models of targeted subjects and realistic models of imaging scanners—and the authors of this *AJR* article developed the first computational models of patients with COVID-19, while showing, as proof of principle, how they can be combined with imaging simulators for COVID-19 imaging studies.

"For the body habitus of the models," lead author Ehsan Abadi explained, "we used the 4-D extended cardiac-torso (XCAT) model that was developed at Duke University."

Abadi and his Duke colleagues then segmented the morphologic features of COVID-19 abnormalities from 20 CT images of patients with multidiagnostic confirmation of SARS-CoV-2 infection and incorporated them into XCAT models.

"Within a given disease area, the texture and material of the lung parenchyma in the XCAT were modified to match the properties observed in the clinical images," Abadi et al. continued.

Using a specific CT scanner (Definition Flash, Siemens Healthineers) and validated radiography simulator (DukeSim) to help illustrate utility, the team virtually imaged three developed COVID-19 computational phantoms.

"Subjectively," the authors concluded, "the simulated abnormalities were realistic in terms of shape and texture," adding their preliminary results showed that the contrast-to-noise ratios in the abnormal regions were 1.6, 3.0, and 3.6 for 5-, 25-, and 50-mAs images, respectively.
Images of same phantom show simulated CT at 50 (A), 25 (B), and 5 (C) mAs, as well as simulated chest radiograph (D). Credit: American Roentgen Ray Society (ARRS), American Journal of Roentgenology (AJR)


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