Rapid onsite FFR-CT algorithm helps facilitate clinical adoption

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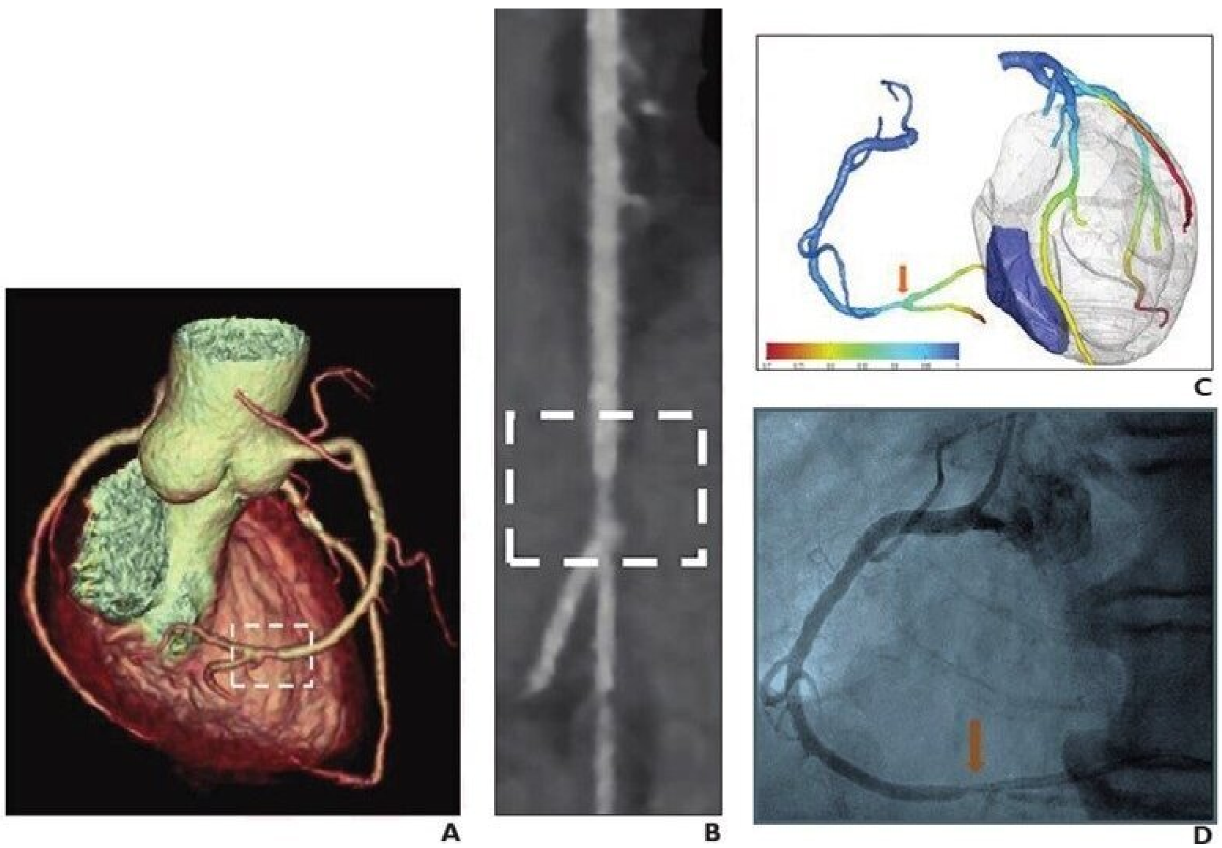

(A) 3D volumetric rendering of coronary arteries, and (B) multiplanar reconstruction, show distal right coronary artery lesion (dashed box). (C) Image from onsite deep learning-based FFR-CT algorithm shows corresponding lesion (arrow). FFR-CT was 0.87. (D) Image from subsequent invasive coronary angiography shows corresponding lesion (arrow). Invasive FFR was 0.85, consistent with absence of hemodynamically significant stenosis. Credit: ARRS/AJR

According to a study published in *American Journal of Roentgenology* (*AJR*), a high-speed onsite deep-learning based fractional flow reserve (FFR)-CT algorithm yielded excellent diagnostic performance for the presence of hemodynamically significant stenosis, with both high interobserver and intraobserver reproducibility.

"A rapid and accurate onsite approach for determining FFR-CT should address challenges encountered in the clinical adoption of prior FFR-CT implementations," wrote corresponding author Ronny Ralf Buechel, MD, from University Hospital Zurich in Switzerland.

In this *AJR* study, 59 patients (46 men, 13 women; mean age 66.5 years) underwent coronary CTA (including calcium scoring) followed within 90 days by invasive angiography with invasive FFR and/or instantaneous wave-free ratio (iwFR) measurements from December 2014 to October 2021. Coronary artery lesions were considered to show hemodynamically significant stenosis in the presence of invasive FFR ≤0.80 and/or iwFR ≤0.89.

A single cardiologist evaluated CTA images using an onsite deep-learning based semiautomated algorithm employing a 3D computational flow dynamics model to determine FFR-CT for coronary artery lesions detected by invasive angiography. Then, time for FFR-CT analysis was recorded. FFR-CT analysis was repeated by the same cardiologist in 26 randomly selected examinations, as well as by a different cardiologist in 45 randomly selected examinations.

Ultimately, Buechel and colleagues' onsite deep-learning based FFR-CT algorithm evidenced AUC for hemodynamically significant stenosis—based on invasive angiography—of 0.975, sensitivity of 93.5%, and specificity of 97.7%. Among severely calcified lesions, their same algorithm had AUC of 0.991, sensitivity of 94.7%, and specificity of 95.0%. Moreover, the mean analysis time was 7 minutes and 54 seconds.

"To our knowledge," the authors of this *AJR* accepted manuscript added, "the currently reported mean processing timer represents the fastest reported time for onsite FFR-CT analysis."

More information: Andreas A. Giannopoulos et al, High-Speed Onsite Deep-Learning Based FFR-CT Algorithm: Evaluation Using Invasive Angiography as Reference Standard, *American Journal of Roentgenology* (2023). DOI: 10.2214/AJR.23.29156

Nobuo Tomizawa, Editorial Comment: On-Site Deep Learning–Based FFR-CT—A Novel Method to Evaluate Functionally Significant Stenosis, *American Journal of Roentgenology* (2023). DOI: 10.2214/AJR.23.29561

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