Letter by Mao et al Regarding Article, “Non-Invasive Fractional Flow Reserve Derived From Computed Tomography Angiography for Coronary Lesions of Intermediate Stenosis Severity: Results From the DeFACTO Study”

To the Editor:

We commend Nakazato et al for their excellent article entitled, “Non-Invasive Fractional Flow Reserve (FFRCT) for Coronary Lesions of Intermediate Stenosis Severity: Results From the DeFACTO Study.” The well-performed multicenter study concluded that FFRCT possessed higher diagnostic performance for ischemia for coronary lesions of intermediate stenosis severity than CT stenosis. Besides, the high sensitivity and negative predictive values suggested the ability of FFRCT to rule out intermediate lesions effectively that cause ischemia. However, we have some concerns about the study.

First, when interpreting FFRCT, 3-dimensional (3D) flow simulations of the coronary arteries were performed, and blood was modeled as a Newtonian fluid to use incompressible Navier–Stokes equations. A method to couple lumped parameter models of the microcirculation to the outflow boundaries of the 3D model was used. However, there may be some differences in vivo versus in vitro simulation. For instance, the elasticity of arterial wall may greatly affect the cardiac perfusion pressure in vivo, which was improperly neglected in the computation of FFRCT.

Second, for lesions of intermediate stenosis severity, FFRCT versus CT stenosis accuracy, sensitivity, specificity, positive predictive value, and negative predictive value was 71% versus 63%, 74% versus 33%, 67% versus 72%, 41% versus 27%, and 90% versus 78%, respectively. Although there was a 2-fold increase in sensitivity and high negative predictive value of FFRCT, we must notice the poor performance of FFRCT in specificity and positive predictive value. The lower specificity and positive predictive value quenched the passion for the costly and complicated method of FFRCT although it showed a promising role in excluding ischemia with high sensitivity and negative predictive values. Besides, FFRCT is also confined because of the limited indications of CT angiography in the condition of advanced calcific coronary artery disease and in patients with irregular heart rhythm, tachycardia, or motion artifact.

Finally, a recent approach of virtual FFR derived from invasive coronary angiography (ICA) was investigated based on the first-pass analysis and computational fluid dynamics. ICA-derived virtual FFR did not have the limited indications of FFRCT. Moreover, patients who underwent FFRCT will likely require the ICA confirmation because of the poor diagnostic performance of FFRCT in specificity and positive predictive value. Therefore, no additional test and cost are needed when virtual FFR and ICA are examined simultaneously. Accordingly, ICA-derived virtual FFR, similarly like FFRCT, may also have a promising role in detecting coronary lesions of intermediate stenosis severity.

Disclosures

None.

Yu Mao, MD*
Division of Cardiology
Tongji Hospital, Tongji University School of Medicine
Shanghai, China

Xiaolong Qi, MD*
Institute of Digestive Disease
Tongji Hospital, Tongji University School of Medicine
Shanghai, China

Lin Zhou, MD
Division of Cardiology
Tongji Hospital, Tongji University School of Medicine
Shanghai, China

References


*Drs Mao and Qi contributed equally to this work.

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