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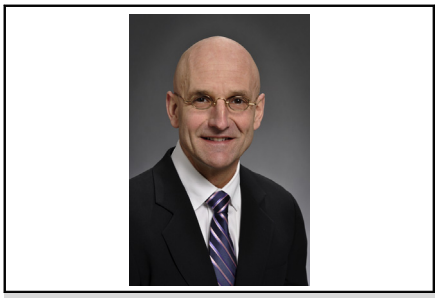
CONG

Commentary: Modeling anomalous coronaries: Hard to predict the predictability of prediction

Ronald K. Woods, MD, PhD



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CENTRAL MESSAGE

A creative model to predict the behavior of anomalous coronaries may enhance prediction of clinical behavior, but predictability remains to be verified.

A reputable computer modeling group introduced a novel approach to modeling the behavior of coronaries with abnormalities of sinus origin, focusing at this point on the right coronary artery (RCA).[1] The highly welcomed contemporary consensus statements based on cumulative data provide a framework for standardizing the approach to an anomalous RCA from the left sinus. Nevertheless, we all desire a model that reliably predicts the behavior of a given patient's RCA and myocardium in response to increased pressure loading and/or demand.

Lo Rito and colleagues[1] appropriately describe the limitations of their work and their very preliminary results based on a handful of patients. Aside from the typical drawbacks inherent to any type of modeling exercise, 1 feature of this model merits further comment: The diameter-distance curves for the controls. The increased ostial diameter at higher pressures is intuitive, as is the decrease in diameter (although higher than baseline condition) as the vessel courses through the wall of the aorta, the thickness of which, by the way, was not obtained from patient-specific data. However, I find entirely nonintuitive the completely flat curve for the baseline condition (80 mm Hg) at which there should be sufficient pressure to induce a change in intrawall vessel caliber. I suspect the conditions imposed by the model created this "artifactual" result, which is also present in the baseline condition for study subjects. I trust further refinements in the model will render it more realistic.

Setting aside any limitations, let's suppose the model is further refined and models the behavior of a living root and coronary artery with perfect fidelity. In the context of numerous other stress and nonstress diagnostic modalities, none of which stand alone as the gold standard, will the model answer the critical questions of whether we operate or restrict intense exercise? The virtual impossibility of a prospective randomized study might still permit modeling data into the decision-making process—seems challenging at best, but perhaps artificial–intelligence-driven scrutiny of diameter-distance curves would enable a role with some level of utility. However, I am skeptical. I find it very challenging to predict just how predictably such a model will predict future events. Nevertheless, I congratulate the authors for their creativity and expertise and thank them for their effort to help us navigate the conundrum of uncertainties pertaining to anomalies of coronary origin.

Reference

1. Lo Rito M, Romarowski RM, Rosato A, Pica S, Secchi F, Giamberti A, et al. Anomalous aortic origin of coronary artery biomechanical modeling: toward clinical application. *J Thorac Cardiovasc Surg*. 2021;161:191-201.e1.

From the Division of Pediatric Cardiothoracic Surgery, Herma Heart Institute, Children's Wisconsin; and Department of Surgery, Medical College of Wisconsin, Milwaukee, Wis.

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Address for reprints: Ronald K. Woods, MD, PhD, Department of Surgery Medical College of Wisconsin, 9000 W Wisconsin Ave, MS B 730, Milwaukee, WI 53226 (E-mail: rwoods@chw.org).

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