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Key Words: AAOCA, anomalous aortic origin of the coronary artery, computed tomography, congenital heart disease, ischemia, risk stratification, simulation, sudden cardiac death

Discussion

Presenter: Dr Mauro Lo Rito

Dr Pirooz Eghtesady *(St Louis, Mo).* As discussed by many of the presenters, we continue to struggle with knowing what parameters to use as a predictive measure for deciding on surgery or not for this population of patients. I understand your study has a small sample size, but I would like to push you a bit, if you will, to answer a few questions despite limited data. You show in your control group that the coronaries expand and contract, and in the anomalous right, they don't. I found it similarly a nice internal control that the LCA expanded in the patients with anomalous RCA and the anomalous coronary did not.

You had 5 patients, and I saw the aggregate data, but of these 5, 3 were symptomatic, and 2 had relief of symptoms with rest and 1 had release of troponin, ST changes, and so forth. Two were completely incidental findings. When you look at your data, did you see symptoms correlate with the degree of coronary expansibility, meaning less expansible were more symptomatic or anything along that paradigm?

Dr Mauro Lo Rito *(San Donato Milanese, Italy).* Yes, we may see them, but I did not want to comment on that because in such a small sample, we cannot draw any conclusion or correlation clinical decision or severity based on our model that is not entirely validated. Can we look back to a previous slide, please? I will show you the patient that we operated on, but we took the decision based on clinical evaluation of those who have the greatest compression.

These 3 patients on the first vertical column are those who have undergone operation. I don't want to draw any conclusions, but they have the lowest values of the cross-sectional area at stress. I want to draw your attention to these downward inflections. I thought initially there was a mistake in the model, but looking at the measurement and reconstruction, this is the point that corresponds to the aortic valve commissure pillar that Dr Mery talked about. So the inflection correlates with the anatomy of the intraoperative findings. This region of major stiffness, see also at the simulation, may be a source of further compression. I don't want to draw any conclusion with these 5 patients, but we have promising results. We may be working in the right direction.

Dr Eghtesady. The second question is related to the interesting observation you made on angulation of the left coronary, which you found was different in the subjects with anomalous coronary versus the controls. With the loading conditions you tested, did you see any changes in the angulation of the LCA beyond the 30/35 degrees that you mention? Was there any correlation with symptoms? It makes me wonder if we've ignored something important regarding the so-called normal coronary in these patients.

Dr Lo Rito. On that point, I have to talk honestly of course, because I do not want to give false findings regarding the model. I think it might be an issue related to the way we achieved the parameters on the CT. To measure that angle, we use the cross-sectional imaging of the aorta. We use as the first side of the angle a line between the half of the noncoronary sinus commissure and the commissure between the right and the left cusp. From there, in the left coronary sinus, we measure the angle of the left coronary ostium origin. Sometimes, the 2 coronary ostia may seem close because of a pouch in the aortic wall because the angle changes, so I don't want to comment on that in terms of anatomy definition.

Dr Eghtesady. Naturally, it would be interesting to see the results with more patients as well as in the anomalous left coronary, but it would be fascinating if you did this for patients postarterial switch and in hypoplasts and see how the coronaries change or respond to the same modeling techniques.

Dr Lo Rito. Thank you for the suggestion.

Dr Pranava Sinha *(Washington, DC).* Does your model take into account the abnormal compliance of the vessel wall as it is in the intramural course, and if so, what compliance indices did you use? Where did you get those?

Dr Lo Rito. As I said in the "Study Limitations," the aortic wall thickness in the model has been set up in a range value achieved by literature reference is not the thickness of the patient aortic wall aorta measured on CT. The same kind of assumptions we did for the compliance of the aorta that has been taken by reference values from different articles on aorta modeling, so there are no patient data in the model that allowed us to simulate the compliance of the aorta. That is a limitation. But you have to start from some point, so you have to make some assumptions and then from there, refine your model. Otherwise, if you have a too complicated model, you may introduce too many errors, and your output can be wrong or unreliable.