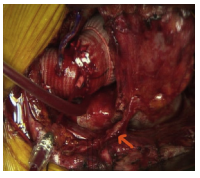
The authors reported no conflicts of interest.

The *Journal* policy requires editors and reviewers to disclose conflicts of interest and to decline handling or reviewing manuscripts for which they may have a conflict of interest. The editors and reviewers of this article have no conflicts of interest.

5. Acharya MN, Youssefi P, Soppa G, Valencia O, Nowell J, Kanagasabay R, et al. Analysis of aortic area/height ratio in patients with thoracic aortic aneurysm and type A dissection. *Eur J Cardiothorac Surg*. 2018;54:696-701.

https://doi.org/10.1016/j.jtcvs.2020.09.041



REPLY: THE FUTURE OF GUIDELINE-BASED PROPHYLACTIC PROXIMAL AORTIC SURGERY IS "PATIENT-SPECIFIC" BUT NOT DIAMETER-BASED METRICS

Reply to the Editor:

In the current issue of the *Journal*, Acharya and colleagues[1] detail in a letter to the editor their recommendations regarding the use of "patient-specific" size parameters for aortic risk prediction and prophylactic proximal aortic surgery. They suggest that the ratio of cross-sectional aortic area/patient height is a reproducible method for identifying at-risk aneurysms and may better inform surgical decision-making. Although the authors are to be commended for their work in this area, given the clearly inadequate current aortic dimensions-based guidelines (Figure 1), which are comprehensively detailed in a recent review in the *Journal*,[2] the ratio espoused by the authors remains a diameter-based index, and we know that any parameter that relies on aortic dimensions suboptimally predicts patient-specific dissection risk.[3]

Recent work from Maiti and colleagues[4] from the University of Pittsburgh using a fiber-level finite element–based structural model of the aortic wall found that the organization and failure properties of the collagen fibers are the primary determinants of aortic tissue strength. Further, they suggested a biomechanically based paradigm

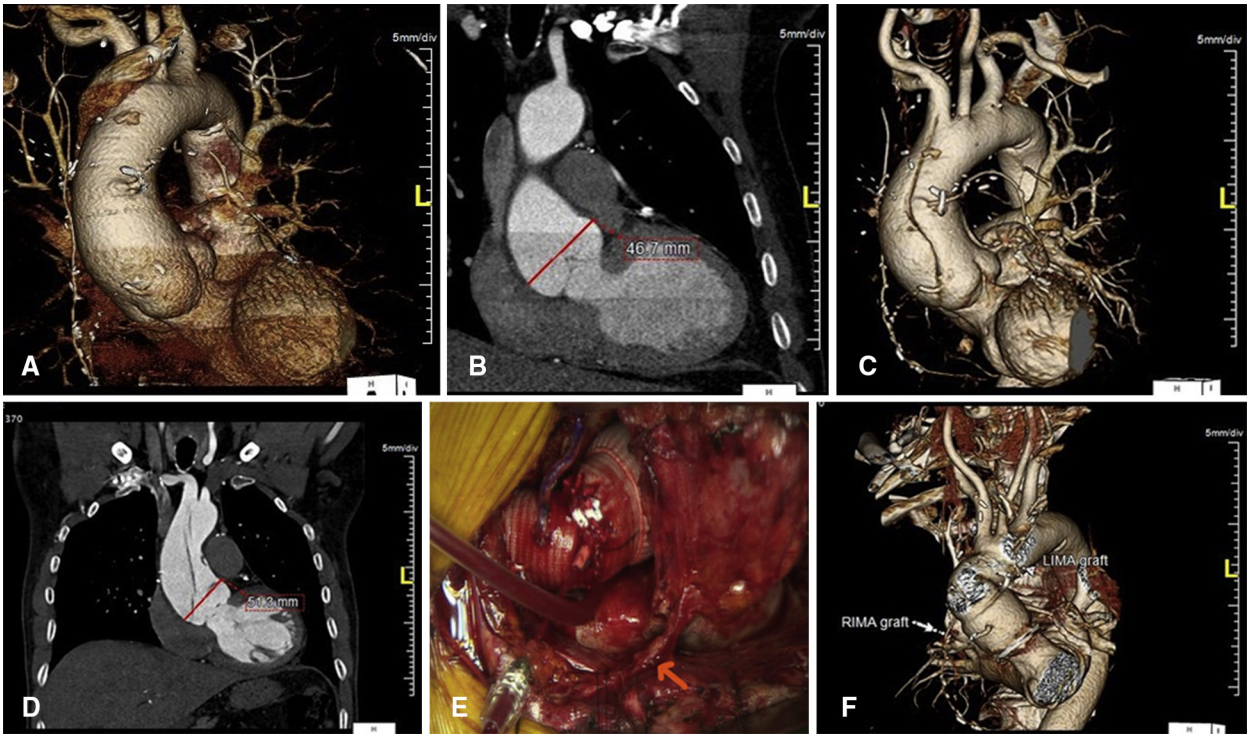


FIGURE 1. CTA and operative images from a 60-year-old male patient status-post previous coronary artery bypass grafting (including bilateral pedicled IMA grafts) 10 years earlier, who dissected under aortic surveillance with aortic dimensions not meeting criteria for surgical intervention. A, Routine surveillance 3D reconstruction CTA image done 2 months before the patient presented with an acute type A dissection. B, Coronal reconstruction image from same scan demonstrating 4.7-cm maximal aortic root diameter, which was stable from the previous year's imaging and did not meet criteria for surgical intervention. C, 3D reconstruction image done 2 months later when the patient presented with an acute type A dissection. D, Coronal reconstruction image from same scan demonstrating increase in maximal aortic root diameter to 5.1 cm as a consequence of the dissection. E, Intraoperative photograph of completed bio-Bentall and hemiarch repair with saphenous vein graft extension to his previous radial arterial graft. Both pedicled IMA grafts were preserved (*arrow* indicates pedicled RIMA graft). F, Surveillance CTA 6 years postoperatively at which time the patient continues to do well clinically. *RIMA*, Right internal mammary artery; *LIMA*, left internal mammary artery.

The author reported no conflicts of interest.

The *Journal* policy requires editors and reviewers to disclose conflicts of interest and to decline handling or reviewing manuscripts for which they may have a conflict of interest. The editors and reviewers of this article have no conflicts of interest.

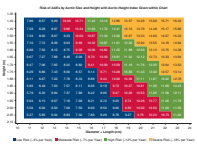
using patient-specific metrics as a means to improve the ability to predict aortic dissection risk and better guide prophylactic aortic repair than the current dimension-based guidelines. Aortic dissection represents biomechanical failure of the aortic wall, and currently the most promising clinical tool to allow measurement of aortic wall stress would appear to be 4-dimensional-flow magnetic resonance imaging of the aorta,[5] which likely represents the future of "patient-specific" guideline-based prophylactic aortic surgery rather than any aortic dimension–based guideline.

G. Chad Hughes, MD
Division of Cardiovascular and Thoracic Surgery
Department of Surgery
Duke University Medical Center
Duke University
Durham, NC

References

1. Acharya M, Mariscalco G, Jahangiri M. When diameter is not enough: in search of the ideal patient-specific size parameter for aortic risk prediction. *J Thorac Cardiovasc Surg*. 2021;161:e255-6.
2. Girardi LN, Lau C, Gambardella I. Aortic dimensions as predictors of adverse events. *J Thorac Cardiovasc Surg*. 2021;161:1193-7.
3. Pape LA, Tsai TT, Isselbacher EM, Oh JK, O'gara PT, Evangelista A, et al. Aortic diameter > or = 5.5 cm is not a good predictor of type A aortic dissection: observations from the international registry of acute aortic dissection (IRAD). *Circulation*. 2007;116:1120-7.
4. Maiti S, Thunes JR, Fortunato RN, Gleason TG, Vorp DA. Computational modeling of the strength of the ascending thoracic aortic media tissue under physiologic biaxial loading conditions. *J Biomech*. 2020;108:109884.
5. Jamalidinan F, Hassanabad AF, François CJ, Garcia J. Four-dimensional-flow magnetic resonance imaging of the aortic valve and thoracic aorta. *Radiol Clin North Am*. 2020;58:753-63.

https://doi.org/10.1016/j.jtcvs.2020.11.045



REPLY: FUTURE PROSPECTS FOR THORACIC AORTIC PREDICTION

Reply to the Editor:

We are in agreement with the points that are made by Drs Acharya, Mariscalco, and Jahangiri.[1] We hasten to emphasize, however, that in any cross-sectional criteria, the only patient variable is the radius of the aorta; the rest is just an arithmetic manipulation of that number.

In terms of prospects for future enhancement of the predictive ability for adverse events, we have the following points to make:

1. Combined morphologic criterion. Aortic length used to be thought of as unimportant, given the benign-sounding moniker of "tortuosity" or "uncoiling." Our group[2] and others[3-5] have begun to focus on length as a newly recognized important parameter. We find that elongation of the ascending aorta (from annulus to innominate artery) is an important predictor of adverse events. In a novel parameter, we add ascending aortic diameter to ascending aortic length and divide by the patient's height.[2] This leads to a parameter that is quite accurately predictive. This accounts for the impact of diameter, of length, and of body size, and body size to some extent accommodates the sex contribution. This produces a simple predictive nomogram (Figure 1).[2] This criterion is based on retrospective analysis of our large database. We look forward to "test driving" this criterion prospectively.
2. Clinical genetics. It is becoming abundantly clear that once a family member dissects, the risk of dissection for other family members increases dramatically. We saw this in our studies (2.7-fold increase compared with aneurysm families without dissection),[6] and it was seen by Raunsø and colleagues[7] and Chen and colleagues[8] (nearly 9-fold and 6.3-fold increase compared with the general population, respectively). Accordingly, we see no reason to wait for the nearly inevitable dissection event in an aneurysm-bearing (almost any size) family member of a known dissector. The very high safety of elective aortic surgery adds to the impetus for such prophylactic intervention.
3. Molecular genetics. The proliferation of whole-exome sequencing permits identification of a specific causative variant for about one-third of our patients with ascending aortic aneurysm.[9] This percentage is certain to increase rapidly as new mutations are identified each year. Remarkably, ascending thoracic aortic aneurysm is mostly a single-gene, single-allele disease, that is to say, a mutation in 1 single letter among the 2.2 billion letters of our genetic code produces the thoracic aortic aneurysm. As our "dictionary" of causative variants expands, we can provide personally tailored intervention criteria for each patient based on their individual mutation. Each mutation has its own size criterion for intervention. Each year, we publish in the journal *Aorta* a "timeline" of the recommended size criterion for each specific mutation (Figure 2).[10]