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REPLY: NOVEL AORTIC IMAGING MODALITIES: MINE DETECTORS OR JUST METAL DETECTORS

Reply to the Editor:

We agree with Ma and colleagues[1] about the potential limitations of the finite element analysis and 3-dimensional models derived from computed tomography angiography of the thoracic aorta used by Wang and colleagues[2] to measure wall stress. Indeed, unlike tricuspid aortic valves, bicuspid valves are associated with different hemodynamic parameters and thoracic aortic wall substrates that can influence wall stress and the associated clinical downstream consequences. In fact, the study by Wang and colleagues[2] made many assumptions, including identical aortic wall composition and thickness and physiologic pressures among all-comers. Although they used patient-derived imaging data in their modeling, as pointed out by Ma and colleagues,[1] it lacked validation and clinical correlation. Furthermore, fluid–structure interaction is critical to account for in an analysis of the aorta and the oscillatory forces within it. Nevertheless, it was an important contribution because it rightly challenged the disproportionate importance assigned to aortic diameter when it comes to making recommendations about timing of surgery. Smaller (<5 cm) thoracic aortas can experience substantial wall stress and this may explain aortic dissections in patients who do not meet the guidelines-based size criteria for intervention.

With regard to biomechanical data derived from in vivo multimodality imaging,[1] the jury is still out on their specificity and predictive value when it comes to aortic dissection or rupture. Those modalities, although promising, are not yet ready for prime time because they need rigorous evaluation and actual risk calibration. With the expansion of computational power and associated advances in analysis of fluid–structure interaction, rapid modeling based on patient-specific data—including physiologic and anatomic details—is now feasible. As we mentioned before,[3] the goal of early and more accurate identification of patients who will benefit from preventative aortic replacement using precision medicine techniques will become a reality soon. In the meantime, there is no substitute for good surgical judgment and skill when deciding on the timing of prophylactic aortic surgery.

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REPLY: ACCURATE EVALUATION OF THE RISK OF ACUTE AORTIC EVENTS: STILL ROOM FOR IMPROVEMENT

Reply to the Editor:

Computational models to better assess the wall properties of the thoracic aorta and thus the individual risk assessment of a subsequent acute aortic syndrome (eg, intramural hematoma, aortic dissection) would be extremely welcome in daily clinical work. The article by Wang and colleagues,[1] the comment by Carrel and Schoenhoff,[2] and the letter to the editor by Ma and colleagues[3] clearly demonstrate not only the interest in, but also the importance of this field, given that inaccurate prediction may lead to an unexpected higher risk of acute aortic complications.

There is no doubt that size alone is not a good indicator of the risk of dissection in any given patient, because numerous individual risk factors may influence the prediction and interpretation of this particular risk; however, size is considered a classical parameter in the guidelines dealing with indications to replace a dilated aortic segment, whereas several additional risk factors (eg, age, family history of acute aortic disease and connective tissue disease) may provide valuable additional information.

In a previous editorial comment,[2] we stated that more modern methods than simple imaging, such as computational modeling and biomechanics, may provide important information regarding aneurysm geometry in general and