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Commentary: We still do not know what we do not know

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CENTRAL MESSAGE

Regarding repair of type B aortic dissection, if at first you do not succeed, only time will tell.

Despite decades of study, there remains a great deal to learn regarding the natural history of chronic aortic dissection. In the current issue of *The Journal of Thoracic and Cardiovascular Surgery*, Higashigaito and colleagues[1] have once again made a substantial contribution to our knowledge of the natural history of chronic distal aortic dissection; specifically, the development of late adverse events in chronic DeBakey type III aortic dissection. Higashigaito and colleagues[1] have retrospectively examined serial computed tomographic (CT) scans from 47 patients initially presenting with acute uncomplicated Stanford type B aortic dissection and not undergoing aortic intervention. During a mean follow-up time of 4 years (ranging from 10 days to 12.7 years), 188 repeat CT imaging scans were performed. Their analysis evaluated morphologic features with time, as well as their association with the development of late adverse events. Higashigaito and colleagues[1] are to be congratulated for evaluating a large number of serial images by means of specialty software that permitted simultaneous review of spatially matched CT imaging data sets to analyze morphologic changes manually in each individual, despite a complex and lengthy processing time.

Conclusions derived from these data are important. Notably, Higashigaito and colleagues[1] point out that their current experience reinforces their previous findings[2]; not only was partial false-lumen thrombosis uncommon at baseline, it was also not a predictor of late adverse events. Although Higashigaito and colleagues[1] noted that the primary intimal tear got larger with time, this enlargement was not associated with an increased risk of late adverse events. Despite an increase in the number of secondary tears observed with time (which facilitates additional communication between the true and the false lumens), this likewise did not influence risk. Lastly, it is certainly not a surprise that they found both maximum aortic diameter and change in maximum aortic diameter with time to be strong predictors of late adverse events. This has been known for years and never contested—large diameters are bad in every aortic scenario.

Limitations, as noted by Higashigaito and colleagues,[1] include the fact that this was a retrospective study that evaluated a relatively small number of patients with a similarly limited number of imaging data sets. Regardless, the physical effort needed to analyze serial data sets manually is almost epic in proportion. Consequently, Higashigaito and colleagues[1] point out an extremely important direction for future analysis—machine learning algorithms may be able to supplant the burdensome manual work currently necessary, as well as to expand on existing data sets to create far greater means of generating information useful to clinicians. Will similar analyses result in comparable findings for patients undergoing thoracic endovascular aortic repair to treat DeBakey type III aortic dissection or those undergoing frozen elephant trunk (or antegrade thoracic endovascular aortic repair) to treat DeBakey type I aortic dissection? In the future, this type of knowledge acquisition, along with artificial intelligence, may provide a path to help us get beyond not knowing what we do not know so that we can solve the problem of what we need to know.

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Commentary: Type B aortic dissections: Bigger is never better

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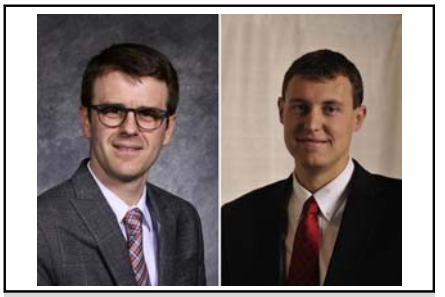

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CENTRAL MESSAGE

Increasing overall or false lumen size on follow-up CT predicts late adverse events (LAEs). However, as LAEs are mostly aneurysmal degeneration, the utility for early prognostication is limited.

Higashigaito and colleagues[1] report their work examining risk factors for adverse events after type B aortic dissection. They have developed a database of acute uncomplicated type B dissection from their institution and published previously on this cohort and risk factors leading to late complications.[2] In this analysis, the authors investigated the associations of 8 different aortic morphologic features extracted from long-term follow-up computed tomography scans. These included number and size of intimal tears, intercostal arteries, flap mobility and extent, aortic size, false lumen size and drainage, and extent of thrombus.

This work excludes previously included patients with intramural hematoma, which provides a more homogenous population with increased internal validity. However, they are left with only 47 patients, requiring the use of a composite endpoint of late adverse events (LAEs). Consistent with previous literature, 21 patients (45%) developed LAEs over the median 6.6 years of follow-up. This is where the main limitation of the manuscript is found, namely that LAEs were defined as aneurysmal degeneration, rapid growth, new dissection, rupture, malperfusion, or death. The vast majority of events (86%) were aneurysmal degeneration. It is therefore relatively unsurprising that the variables associated with increasing lumen size (increased partial false lumen thrombus, increased aortic diameter and increased extent of false lumen) were most associated with LAEs. Although not perfectly applicable in the elastic vasculature of the human body, the law of Laplace states that cylindrical wall tension is proportional to the radius and pressure. Reduced to its most simple form, the question of who will develop LAEs is simply physics. Using a late surrogate such as size on follow-up seems at best a late signal that the patient is heading toward aneurysmal degeneration requiring repair. Future research needs to focus on early predictors of the fluid dynamics leading to pressurization and future dilation of the aorta. Recent work in this *Journal* has highlighted possible 4-dimensional technologies that could detect patients at risk for enlargement immediately after dissection.[3] It is the upfront identification of patients who will need future intervention that could prevent the cost, radiation, and anxiety associated with continuous follow-up after uncomplicated acute type B dissections.

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