Bicuspid aortopathy and the development of individualized resection strategies

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In an effort to better understand current surgical approaches, we compared the knowledge and attitudes of individual surgeons toward the diagnosis and management of bicuspid aortopathy.1 Surprisingly, surgeons’ approaches often went outside established guidelines, with marked differences in the timing, extent, and type of operative strategy of aortic resection. Bicuspid aortopathy is a commonly encountered clinical scenario, so why are surgeons so disparate and non-compliant with current recommendations? We believe that the heterogeneous nature of the disease and its diverse clinical phenotypes2 may influence a surgeon’s threshold for aortic replacement, despite current guidelines. Unfortunately, there are no consensus recommendations on the type or extent of aortic repair for an individual patient with bicuspid aortopathy, and no randomized clinical trials are available to better inform clinicians as to whether an aggressive versus conservative approach is appropriate. Although arm-deep in a patient’s chest and inspired by the best intentions, surgeons might avoid the recommendations in selected patients and recognize that contemporary guidelines for aortic resection in patients with bicuspid aort valve based solely on maximal aortic diameter are deficient and lack an appreciation for the numerous factors that may underlie disease progression.

To achieve optimal clinical outcomes for bicuspid aortopathy, individualized surgical approaches for patients with bicuspid aortic valve disease may be a necessity. In their report in this issue of the Journal, Sievers and

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colleagues examine the outcomes with use of their preferred approach to manage the ascending aorta during bicuspid valve surgery. The approach is novel and provides individualized resection strategies and includes “in the moment” assessments going far beyond maximal aortic diameter. It is not surprising that this group of expert surgeons observed excellent clinical results. The approach acknowledges and then attempts to balance the surgical risk with the perceived extent and magnitude of the aortopathy for each individual patient and then tailors the type and extent of aortic resection accordingly. The strategy is unique such that patients at intermediate risk were treated with aortoplasty compared with complete resection. Aortoplasty does address the issue of maximal aortic diameter, but without resection it may also retain affected aortic tissues at risk of future expansion, rupture, or dissection. Although the clinical outcomes were adequate, these patients may not have needed any aortic intervention. Determination of intermediate risk may not be simple using current criteria. The lack of randomization or a comparative group with appropriate analysis is lacking. Surgeons would not be wrong to adopt the proposed approach. But would they be right? We simply do not know. Further study with longer follow-up periods, serial imaging of the aortoplasty patients, and additional comparative analysis will be needed to determine whether this approach is indeed preferred and can be widely recommended.

To optimally address each patient with bicuspid aortopathy on an individual basis with a tailored surgical strategy, the science must first advance. We must develop and validate the predictive tools needed to appropriately risk stratify patients, and only then can the optimal treatment strategy be used. In this study, intraoperative criteria were used to estimate the degree of aortopathy and then guide the surgeon to the extent and best approach to aortic resection. Sadly, the “look and feel” of the aorta are subjective criteria that are nonvalidated and likely suffer from problems of poor sensitivity and specificity. Many surgeons use wall thinning and friability in decision-making, and certainly this is reasonable in the absence of better alternatives. We believe that the use of advanced imaging modalities in combination with biomarkers may prove to be superior. By using 4-dimensional flow magnetic resonance imaging technology, we recently showed that valve fusion patterns predicted the degree and location of aortic dilatation. Imaging of regional flow abnormalities may help identify areas at risk of long-term complications that should be resected. Biomarkers are being explored and may help identify individual patients with aggressive phenotypes that may benefit from more extensive and perhaps earlier resections. In combination with advanced imaging, these predictive tools could be used to enhance decision making preoperatively and avoid crucial decisions “in the moment.”

To develop individualized resection strategies, we must advance the science of bicuspid aortic valve aortopathy and determine the key molecular and cellular mechanisms underlying its progression. Until such time, expert surgeons will continue to use their own individualized approaches for each patient. The results of this study provide reassurance that even without the science needed to develop and validate best practices, surgeons using individualized aortic resection strategies can and do provide substantial benefits for their patients with bicuspid aortic valves.

References