At our institution, we have adopted a more aggressive approach to repair all valves with AI with freedom from AI at 5 years being 93% and freedom for aortic valve replacement being 94%.[3] Bavaria and colleagues also reported a similar aggressive approach, and reported very minimal AI recurrence at midterm follow-up.[4] Our experience along with several others[5] confirm the long-term safety of cusp repair, with acceptable rates of failure and reoperation.

The current study also confirms similar outcomes after cusp repair, albeit in a small group of patients at midterm follow-up. Despite these excellent outcomes with cusp repair, surprisingly the Kaplan-Meier curves indicate that 35% of patients in the cusp repair group had some AI immediately after surgery, and freedom from AI in the cusp repair group worsened with time. These results are potentially misleading because of the small number of cusp repair patients. Thus, the question of whether aggressive cusp repair versus a more conservative approach is superior in the long term may need further investigation. Experimental studies on the effect of cusp repair on mechanics of the valve and its degenerative potential may be contributory.

In summary, the Cornell aortic team should be commended for taking a highly unique and individualized approach to VSRR for correction of AI in BAV anatomy. This group has shown that VSRR for BAV AI can be done using a conservative approach with commendable midterm results.

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ADULT

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Commentary: Valve-sparing root replacement in bicuspid valves—more than technique

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CENTRAL MESSAGE

The optimal approach to cusp repair in valve-sparing aortic root operations for bicuspid aortic valve patients remains an area of investigation.

A number of giants in the field of cardiothoracic surgery have, in our lifetime, advanced and elevated the discipline of aortic root surgery, with the ultimate goal of preserving native valve tissue and durable long-term function.[1] The knowledge gained and the techniques developed by these pioneers more recently have been applied to valve-sparing root (VSR) operations in patients with bicuspid aortic valves (BAV) and root aortopathy. In deciding which patients with BAV are candidates for VSR, one axiom on which there is broad agreement is the prerequisite of good

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TABLE 1. Mechanisms and considerations in bicuspid aortic valve–sparing root operations

Mechanisms of AI	Dilation: annulus, root, STJ Cusps: calcification, restriction, prolapse, fenestration, penetration Raphe: fibrosis, calcification, incomplete
Repair considerations and techniques	Reimplantation vs remodeling Annular stabilization: subcommissural plication, suture annuloplasty Sinus reconstruction STJ remodeling Commissural orientation, intercommissural distance Effective height Coaptation length Cusp: plication, debridement, resection, reconstruction with pericardial patch Raphe: shaving, resection, closure Free margin: plication, resuspension

AI, Aortic insufficiency; *STJ*, sinotubular junction.

leaflet quality. With heterogenous mechanisms of aortic insufficiency (AI) in these patients, there remains uncertainty as to which factors and techniques best portend a durable result (Table 1).

In this issue of the *Journal*, Lau and colleagues[2] report on their institutional experience with VSR replacement in BAV. On the basis of long-term freedom from AI progression and reoperation, they concluded that VSR in BAV can be "reliably performed…often without the need for cusp reconstruction." However, this statement should be read with a clear understanding of their patient selection strategy. The conservative nature of their approach is demonstrated by comparison with the Toronto experience.[3] In Lau's series, cusp repair techniques were used in 22.7%, with techniques limited to raphe debridement/closure (47%) and central plication (53%). In the Toronto series, primary cusp repair was used in 79%; cusp repair technique was most frequently cusp plication (76%), followed by raphe resection (33%) and free margin reinforcement (25%). These 2 groups of patients were clearly different in preoperative valvular dysfunction, with preoperative AI greater than mild being 27% in Lau and 78% in Ouzounian. Lau and colleagues' primary message, on the basis of the 10 patients with postrepair mild AI, is that avoidance of cusp repair is preferable to cusp manipulation, even if it means tolerance of immediate postrepair mild AI. Obviously, this can only be applied when the baseline cohort has little preoperative valve dysfunction. Accordingly, although we laud the excellent results, we find that comparison with other series is on a different playing field. Their study findings give no insight as to what is the best treatment for moderate or greater AI.

However, comparison of another set of numbers suggests a second intriguing factor. In Lau and colleagues, preoperative mean root diameter was smaller (median 44 vs 52 mm), as was selected graft size (29.9 $\pm$ 1.42 mm vs 31 $\pm$ 3 mm). Although graft sizing remains a measure subject to surgeon judgment and technique, these differences raise the possibility that Lau and colleagues represented earlier surgical intervention for aortopathy, before the onset of greater degrees of aortopathy and greater valve distortion and dysfunction. Ultimately, the variability in patient selection and repair techniques make comparisons and generalization of experiences challenging. Contributions to the literature, such as that from Lau and colleagues, will continue to incrementally inform our field.

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