contributes to postoperative morbidity after surgery for congenital heart disease. Quantification of either effect, however, remains a challenge.

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CARDIAC MAGNETIC RESONANCE IMAGING FOR ASSESSMENT OF AORTIC VALVE MORPHOLOGY

To the Editor:

We noted with interest the findings of Malaisrie and colleagues,¹ who reported in the August 2012 issue of the *Journal* that cardiac magnetic resonance imaging (CMRI) was superior to 2-dimensional transthoracic echocardiography (TTE) in determining the presence of a bicuspid aortic valve.

At our institution, we compared the accuracies of CMRI and TTE in the

TABLE 1. Accuracy of 2-dimensional transthoracic echocardiography versus cardiac magnetic resonance imaging in the identification of aortic valve morphology

Classification	TTE findings	CMRI findings	Surgical findings
Tricuspid valve	24 (66%)	27 (75%)	26 (72%)
Bicuspid valve	6 (17%)	8 (22%)	10 (28%)
Nondiagnostic	6 (17%)	1 (3%)	

Data are presented as number and percentage of patients. TTE, Transthoracic echocardiography; CMRI, cardiac magnetic resonance imaging.

identification of aortic valve morphology by comparing both with pathologic examination at the time of surgery as the criterion standard for diagnosis. Thirty-six subjects with severe aortic stenosis underwent both TTE and CMRI before aortic valve replacement. Valve assessment was classified as tricuspid valve, bicuspid valve, or nondiagnostic. The findings are outlined in Table 1.

CMRI was superior to TTE for identification of valve morphology, with a diagnostic, concordance of 94% versus 78% with TTE (κ for CMRI 0.85, $P < .001$; κ for TTE 0.45, $P = .007$). More specifically, test sensitivity for bicuspid aortic valve morphology was 80% with CMRI and just 60% with TTE. The accuracy of TTE morphologic assessment may be influenced by the severity of aortic valve calcification (moderate 87%; severe 70%), although this difference did not reach statistical significance ($P = .24$).

The correct identification of valve morphology has important clinical implications, in particular with regard to the associated aortopathy with bicuspid aortic valve disease, because operative intervention on the ascending aorta is recommended at a smaller threshold than with atherosclerotic disease.²

CMRI enables a comprehensive assessment of the valve, left ventricle, and aorta in patients with aortic stenosis, although routine clinical application for this purpose is not yet available because of the limitations of cost and availability of scanner time, in addition to standard contraindications for CMRI (rapid uncontrolled arrhythmia, metallic

implants, permanent pacemaker, claustrophobia). The alternative to CMRI is transesophageal echocardiography, which can accurately define aortic valve morphology³; however, this procedure is semi-invasive, requires intravenous sedation, and may present difficulties in complete evaluation of the thoracic aorta.⁴

Our findings replicate those of Malaisrie and colleagues,¹ and we propose that in selected individuals with aortic stenosis and dilated ascending aortas, CMRI increases the diagnostic certainty of anatomic assessment, thereby improving risk stratification and assisting with decisions regarding the timing of surgical intervention.

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Reply to the Editor:

We thank Grewal and colleagues for their interest in our article, "Cardiac magnetic resonance imaging is more diagnostic than 2-dimensional echocardiography in determining the presence of bicuspid aortic valve."¹ In our study, we found that transthoracic echocardiography (TTE) correctly discriminated 62% of patients with bicuspid aortic valve, compared with 93% with cardiac magnetic resonance imaging (CMRI).¹ Excluding nondiagnostic test results, the sensitivities for bicuspid aortic valve were 86% for TTE and 96% for CMRI.¹ Our study population included patients with aortic stenosis, regurgitation, and normally functioning valves.

We congratulate Grewal and colleagues for analyzing their own experience with preoperative imaging for bicuspid aortic valves. Their experience showed very similar results to ours, with identification rates of 78% with TTE and 94% with CMRI. Sensitivities were also similar to our results, with 60% for TTE and 80% for CMRI. Grewal and colleagues' results do differ slightly from ours because their patient population focused on aortic stenosis only, which we found to reduce the accuracy of both preoperative tests.¹

Clearly, the implications for correct preoperative identification of bicuspid aortic valve are significant. From a practical standpoint, we perform

CMRI in all patients that are found by TTE to have a bicuspid aortic valve to evaluate the ascending aorta completely into the transverse aortic arch for the presence of aneurysm related to associated ascending aortopathy. We also perform CMRI in all patients who have TTE results nondiagnostic for aortic valve morphology. In this group of patients, CMRI can reliably identify valve morphology. We perform CMRI selectively in patients who are found on TTE to have a normal trileaflet valve. Recognizing that the TTE incorrectly identifies a trileaflet valve in 10% of patients who indeed have a bicuspid aortic valve, we perform CMRI in younger patients with aortic valve dysfunction (valve dysfunction typically occurs in younger patients with bicuspid aortic valve) and in patients with borderline ascending aortic aneurysm (aneurysms related to bicuspid aortic valve carry increased risks of dissection and rupture).

We agree with Grewal and colleagues that CMRI improves diagnostic certainty, improves risk stratification, and assists in surgical decision making in patients with bicuspid aortic valve.

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VALUE OF THE TRICUSPID ANNULAR PLANE SYSTOLIC EXCURSION AS A FOLLOW-UP PARAMETER IN PATIENTS WITH HYPOPLASTIC LEFT HEART SYNDROME

To the Editor:

We read with great interest the recent article from Kasnar-Samprec and colleagues,¹ "Unloading of Right Ventricle by Bidirectional Superior Cavopulmonary Anastomosis in Hypoplastic Left Heart Syndrome Patients Promotes Remodeling of Systemic Right Ventricle But Does Not Improve Tricuspid Regurgitation." In our opinion, this is an interesting article describing effects of volume changes on remodeling of the systemic right ventricle (RV) in patients with hypoplastic left heart syndrome (HLHS). Kasnar-Samprec and colleagues¹ found reduced tricuspid annular plane systolic excursion (TAPSE) relative to age-related reference values in all their study groups. Kasnar-Samprec and colleagues¹ also stated that "most had normal RV function," although how else they assessed RV function was not clearly stated. We would interpret the depressed TAPSE as a sign of impaired RV systolic performance both before and after bidirectional superior cavopulmonary anastomosis. We may add that Klitsie and associates² recently published a study suggesting that longitudinal systolic RV function is expected to be decreased after congenital heart defect surgery. We completely agree with the findings of Kasnar-Samprec and colleagues¹ that bidirectional superior cavopulmonary anastomosis promotes the remodeling of the systemic right ventricle, and we would add that in pediatric patients with different physiology (tetralogy of Fallot that has been addressed surgically), the TAPSE values worsen continuously with time.^{3,4} Kasnar-Samprec and colleagues¹ state that in patients with nonsignificant tricuspid