

Editorial Comment

The optimal method with which to assess right ventricular function

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THERE IS GENERAL AGREEMENT THAT EVALUATION of right ventricular function is important¹ in the pre-immediate postoperative, and long-term assessment of many patients with congenitally malformed hearts, such as those with atrial septal defect, anomalous pulmonary venous connection, tetralogy of Fallot, and lesions where the right ventricle supports the systemic circulation.^{2,3,4} Routine evaluation is difficult, as simple geometric formulas cannot reliably be used to determine ventricular volume.⁵ Recently, three-dimensional echocardiography has become available,⁶ and has been successfully applied for the assessment of left ventricular volumes,⁷ and for experimental measurement of right ventricular volumes.^{8,9} Further clinical use, or routine application, of three-dimensional echocardiography, however, has been hindered by the expensive hardware, which is not universally portable,⁶ by lack of dedicated probes designed for real-time three-dimensional echocardiography in children,¹⁰ by the time requirements for reconstruction of the volumes, and last but not least, by the additional cost. The current paper by Heusch et al.¹¹ points to other important problems. The method of three-dimensional reconstruction using a conventional cross-sectional echocardiographic probe and a probe holder with external rotational capabilities which uses analog data from the videosignal of the echocardiographic machine, may in the first place not be applicable in all patients, and second may not be as accurate as desired. The latter problem may reflect the fact, that first, rotational scanning may not be the

optimal method with which to acquire transthoracic echocardiographic data suitable for reconstruction,¹² second, that a possibly not so golden standard, angiography as opposed to magnetic resonance imaging, was used for comparison.¹³ A third potential flaw was that the manual outline drawn during echocardiographic measurements of the internal ventricular contour excluded major trabeculations and papillary muscles. A possible explanation for the poor agreement between angiography and three-dimensional echocardiography may be that, in the angiographic measurements, trabeculations and papillary muscles cannot be as well seen as with echocardiography, and may not have been completely excluded from the right ventricular cavity. This may well explain why, in the study of Heusch et al.,¹¹ echocardiographic measurements uniformly yielded smaller right ventricular volumes than did angiographic data. Comparison with published echocardiographic studies demonstrates that there is no unanimous agreement whether the trabeculations and papillary muscles should or should not be included in the designated cavity.^{14,15,16} An important step to improve non-invasive assessment of right ventricular volumes may be an official recommendation by the respective working groups on echocardiography on both sides of the Atlantic as to how to consider trabeculations and papillary muscles during volumetry. In the past 2 years, new technical developments, such as improved spatial resolution of real-time volumetric three-dimensional echocardiography, the use of digital rather than analog data for reconstruction, and dedicated integrated probes for transthoracic scanning,⁷ have not only improved the clinical applicability of three-dimensional echocardiography, but also offered the option of providing more accurate data on right ventricular function. This should be assessed in the future by comparing the newer techniques of three-

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dimensional echocardiography with the accepted golden standard of magnetic resonance imaging. The latter technique, like three-dimensional echocardiography, can image right ventricular trabeculations and papillary muscles. It, too, permits the measurement of volumes irrespective of the complex shape of the ventricle.¹⁷

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