Mechanical Dyssynchrony in Dilated Cardiomyopathy With Intraventricular Conduction Delay as Depicted by 3D Tagged Magnetic Resonance Imaging

Cecilia W. Curry, MSE; Gregory S. Nelson, PhD; Bradley T. Wyman, PhD; Jerome Declerck, PhD; Maurice Talbot, RN; Ronald D. Berger, MD, PhD; Elliot R. McVeigh, PhD; David A. Kass, MD

Recent studies have generated interest in the potential for left or biventricular pacing to improve cardiac function in patients with dilated cardiomyopathy and intraventricular conduction delays. The premise is that these hearts display profound basal mechanical dyssynchrony and that pacing can restore synchronization and, thereby, improve function. Here, we demonstrate the extent of mechanical dyssynchrony in such patients. Images were generated by tagged magnetic resonance imaging, which offers a unique noninvasive tool for determining and displaying high-resolution 3D wall motion in patients. Two images are displayed in the Figure: on the left, a normal control patient is seen, and to the right, a patient with severe cardiomyopathy and left bundle branch morphology conduction delay is shown (each image is activated by double clicking over it with the mouse). During systolic contraction, the colors change, reflecting the distribution and timing of regional circumferential strains. Red coding corresponds to the diastolic relaxed state; shortening, by a transition from red to blue; and stretch, by red to yellow. In the normal heart, contraction is synchronous within the myocardium, with a normal symmetric distribution of negative strain (≈−20% by end-systole) across the wall. In contrast, the contraction pattern is markedly dyssynchronous in the heart with dilated cardiomyopathy. Myocardium in the septal region (green dot denotes septum) becomes first blue in early systole and then yellow (ie, stretching) in late systole. Contraction slowly spreads to the lateral wall as the septum develops positive strains. The temporal magnitude of dyssynchrony is substantial. In this and other such patients, ventricular free wall (or biventricular) pacing with preexcitation enhances the systolic function of the heart.

References

From the Division of Cardiology, the Department of Medicine (C.W.C., G.S.N., M.T., R.D.B., D.A.K.), the Department of Biomedical Engineering (B.T.W., J.D., E.R.M., D.A.K.), and the Department of Radiology (E.R.M.), The Johns Hopkins Medical Institutions, Baltimore, Md.

Correspondence to David A. Kass, MD, Halsted 500, the Johns Hopkins Hospital, 600 N Wolfe Street, Baltimore, MD 21287. E-mail dkass@bme.jhu.edu

The editor of Images in Cardiovascular Medicine is Hugh A. McAllister, Jr, MD, Chief, Department of Pathology, St Luke’s Episcopal Hospital and Texas Heart Institute, and Clinical Professor of Pathology, University of Texas Medical School and Baylor College of Medicine. Circulation encourages readers to submit cardiovascular images to Dr Hugh A. McAllister, Jr, St Luke’s Episcopal Hospital and Texas Heart Institute, 6720 Bertner Ave, MCI-267, Houston, TX 77030.

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