

ECHO ROUNDS Section Editor: Edmund Kenneth Kerut, M.D. \_\_\_\_\_

# Doppler Evidence of Persistent Left Atrial Mechanical Standstill with Normal P-Waves by Electrocardiogram after Biatrial CryoMaze Procedure for Atrial Fibrillation

Edmund Kenneth Kerut, M.D.,\* James McKinnie, M.D.,† John P. Reilly, M.D.,‡ Curtis Hanawalt, R.D.C.S.,§ and Charles T. Everson, M.D.¶

\*Heart Clinic of Louisiana, Marrero, Louisiana; †Department of Medicine, Section of Cardiology, Tulane University Medical Center, New Orleans, Louisiana; ‡Ochsner Medical Center, New Orleans, Louisiana; §West Jefferson Medical Center, Marrero, Louisiana; and ¶Department of Surgery, West Jefferson Medical Center, Marrero, Louisiana (Echocardiography 2011:28:809-811)

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A 64-year-old female with exertional shortness of breath and a history of mitral regurgitation with chronic atrial fibrillation (AF) underwent robotically assisted mitral valve repair (34 mm Cosgrove annuloplasty ring; Edwards Lifesciences, Irvine, CA, USA), left atrial appendage (LAA) ligation, and biatrial Maze procedure (CryoMaze; ATS Medical, Inc., Minneapolis, MN, USA). Postoperatively the patient's electrocardiogram (ECG) was normal sinus rhythm (NSR).

A Holter monitor 3 months later (7-day continuous recording) revealed NSR and no episodes of AF. Follow-up ECGs and transthoracic echocardiograms (TTE) were performed 3, 6, and 9 months postoperatively. Each ECG revealed NSR (Fig. 1).

Each postoperative TTE was essentially the same. Mitral regurgitation was mild and overall left ventricular (LV) systolic function was normal. Mitral Doppler inflow (Fig. 2), however, failed to demonstrate late diastolic filling (A-wave) and mitral annulus (lateral, septal, anterior, and posterior) tissue Doppler showed no late diastolic velocity (a'; Fig. 3).

In contrast, an A-wave was noted with tricuspid Doppler inflow (Fig. 4). Also, the lateral tricuspid annulus demonstrated an a'-wave (Fig. 5).

These Doppler findings suggest preserved right atrial (RA) mechanical contraction, but lack of left atrial (LA) mechanical contraction (LA standstill). The mechanism for this finding may

be a resultant electrically "disarticulated" LA from RA. Presumptively the P-waves noted on the surface ECG are from within the RA only (no electrical activity within the LA).

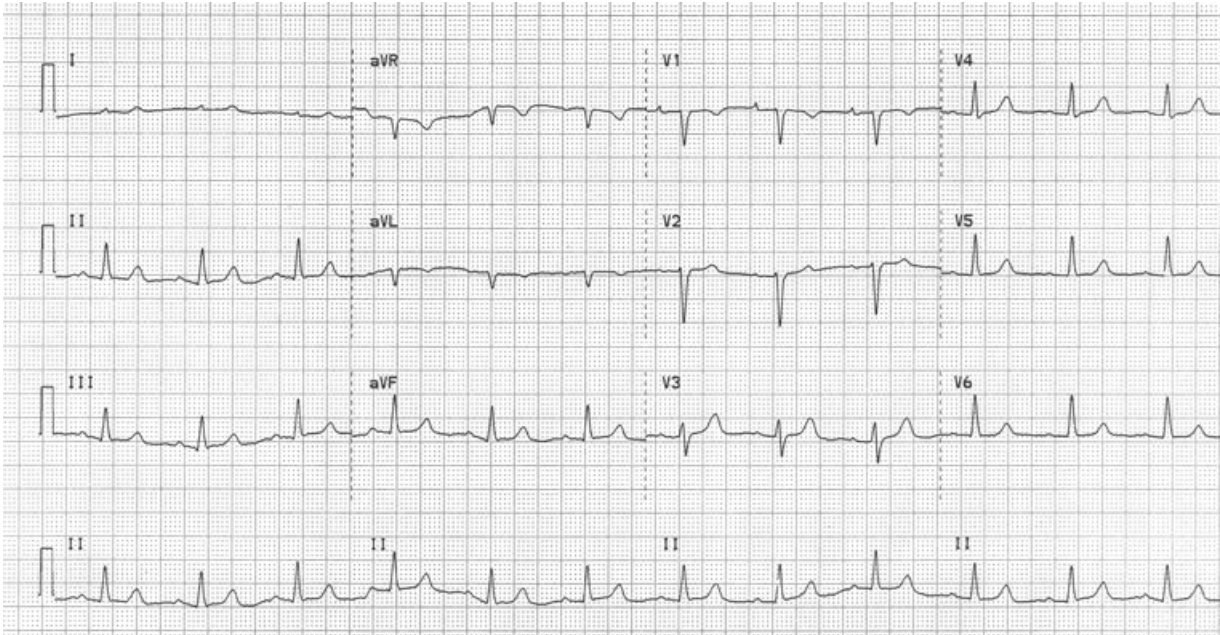
After cardioversion (electrical or chemical) of a patient with AF to NSR, there is often a period of time where P-waves are evident by ECG, but there is no mechanical activity by Doppler studies. If the patient remains in NSR, LA mechanical activity will usually return within several weeks.<sup>1-3</sup> In this patient, LA mechanical activity was not evident nine months postoperatively.

Reports of LA mechanical standstill isolated from an active RA are very rare. A case with severe mitral stenosis<sup>4</sup> and a patient that had undergone two catheter ablation procedures for AF (pulmonary vein isolation, linear ablation, and ablation of fractionated LA electrograms)<sup>5</sup> are noted.

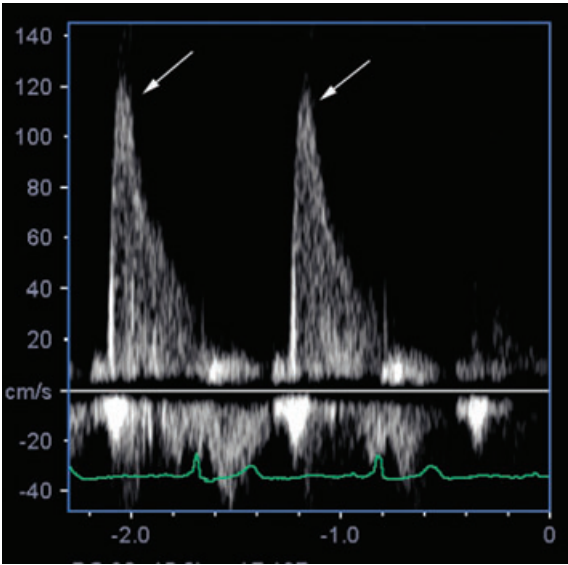
Clinical ramifications of LA standstill for chronic anticoagulation therapy and of the effect from a lack of "atrial kick" on LV function are not known. How prevalent this finding is in patients with a CryoMaze ablation for AF is unknown. As these patients also receive an LAA ligation as part of the operative procedure, it is unknown if LA standstill as a CryoMaze postoperative finding has any clinical significance for anticoagulation therapy, or if the amputation of the LAA is sufficient to protect the patient from the consequences of intracardiac thrombus.

When performing an echocardiogram on a patient who has had a procedure for an atrial dysrhythmia, one should particularly evaluate both RA and LA mechanical function, as a P-wave noted by surface ECG may not be indicative of both RA and LA contractile function.

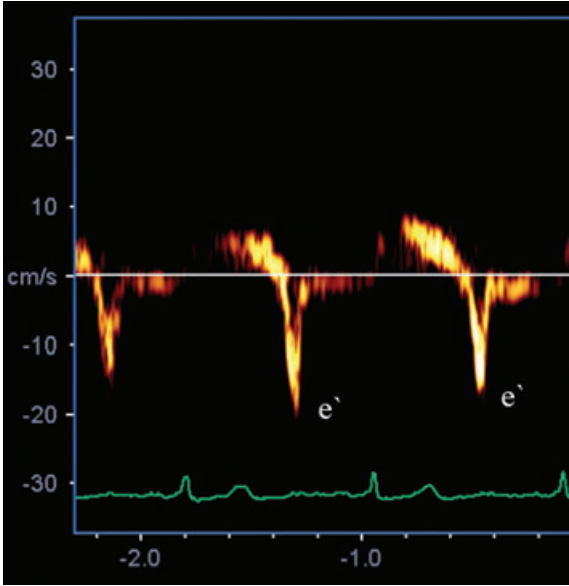
Address for correspondence and reprint requests: Edmund Kenneth Kerut, M.D., Heart Clinic of Louisiana, 1111 Medical Center Blvd, Suite N613, Marrero, LA 70072. Fax: 504-349-6621; E-mail: kenkerut@pol.net



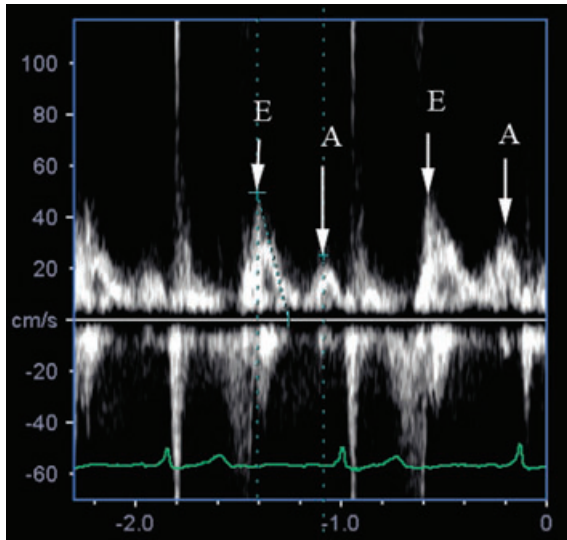
**Figure 1.** ECG obtained 9 months after surgery. The patient’s rhythm is NSR. There was no evidence of atrial fibrillation by sequential ECGs and by Holter monitor.



**Figure 2.** Mitral pulsed-wave Doppler inflow demonstrates an early diastolic E-wave (arrows), but no late diastolic A-wave.



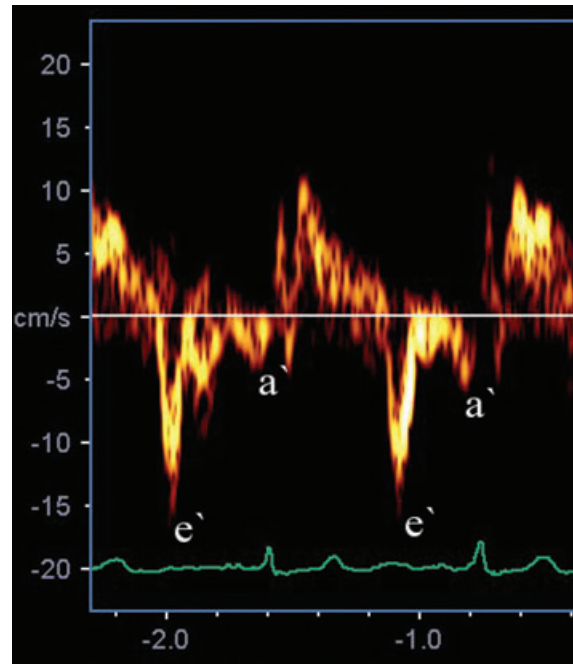
**Figure 3.** Mitral annulus tissue Doppler demonstrates an early diastolic velocity (e'), but no late diastolic velocity (a') is found. This image is from the lateral mitral annulus. There was no a'-wave noted in the superior, inferior, lateral or medial mitral annulus locations.



**Figure 4.** Tricuspid pulsed-wave Doppler inflow demonstrates both an early diastolic E-wave and a late diastolic A-wave.

### References

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**Figure 5.** Lateral tricuspid annulus tissue Doppler demonstrates both an early diastolic velocity (e') and late diastolic velocity (a').

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