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Dynamic Three-Dimensional Echocardiography Offers Advantages for Specific Site Pacing

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We have developed a novel technique for specific site pacing. Our approach is based on three-dimensional (3D) intracardiac echocardiography (ICE) and allows excellent visualization of the interatrial septum (IAS) and specific intracardiac structures (Movie I). Using a standard catheterization technique, the ICE catheter (model 9900, EP Technologies, Boston Scientific Corp) is introduced into the superior vena cava and connected to an ultrasound console (model I5007, Boston Scientific Corp). An ECG and respiration gated and triggered catheter pullback is performed, and the right atrium is reconstructed on-line (Surgical View, TomTec). After 3D reconstruction, the details of the right atrial anatomy are readily recognized and a specific pacing site can be selected. After lead placement and electrical testing, another reconstruction is performed to verify the final position (Movies I through III).

This technique was first tested in pacing of the IAS, which has a fairly characteristic appearance on echocardi-

ography. The clinical results in 15 patients are very promising with this guided pacing modality. We achieved a remarkable 43 ms mean reduction of the P-wave duration. This is more than reported in any previous study. Furthermore, in several patients, we observed that the roof of the right atrium is close to the aorta, and that the tissue between these structures is fairly narrow. Therefore, our approach may have advantages regarding safety issues as well.

The major limitation of this sophisticated lead positioning technique is that ICE with 3D reconstruction capabilities is currently available in a limited number of centers and requires additional training and experience. However, if real time 3D echocardiography is available, the desired pacing site could be achieved with 100% accuracy without use of fluoroscopy. This will be a major asset for imaging and interventional cardiac electrophysiology.

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Movies I, II, and III are available as an online-only Data Supplement at <http://www.circulationaha.org>.

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Circulation encourages readers to submit cardiovascular images to the *Circulation* Editorial Office, St Luke's Episcopal Hospital/Texas Heart Institute, 6720 Bertner Ave, MC1-267, Houston, TX 77030.

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