with MPI may be clinically useful for the evaluation of known or suspected CAD in symptomatic patients. In selected patient cohorts, imaging approaches integrating structure and function may provide improved assessments of risk, thereby allowing a more personalized approach to management.

The Future of Percutaneous MV Therapy

Written by Maria Vinall

Ramesh Daggubati, MD, East Carolina Heart Institute, Greenville, North Carolina, USA, described some of the percutaneous technologies on the horizon for treating mitral regurgitation (MR) and stenosis. He began with the case of an 86-year-old man with a history of diabetes, hypertension, NYHA class III congestive heart failure, and pulmonary hypertension, who had undergone coronary artery bypass surgery in 1994 and received an implantable cardioverter defibrillator in 2007. The patient developed severe MR but was not considered a candidate for mitral valve (MV) surgery. Instead, he was treated in the catheterization laboratory using 2 MV leaflet clips (Figure 1). The patient was transferred to the general ward on day 1 and discharged 4 days later. At 9 months, the patient had only mild residual MR and there had been reductions in left ventricular (LV) volume. The patient's symptoms improved and he continues to do well 4 years after implantation of the mitral clip.

The Endovalve-Herrmann prosthesis is a novel device that is currently being developed for MV replacement. The implant consists of a foldable nitinol structure with specially designed grippers that are repositionable before release. A minithoracotomy is performed on the beating heart and the device is implanted from the left atrial side. Because of the difficulty of keeping the valve in place, another device is being developed that is delivered transseptally and locks onto the inferior and superior surfaces of the mitral annulus. This device has a self-expanding, bi-level nitinol frame and 2 sets of opposing anchors (Figure 2).

EVEREST II [NCT00209274] was the first pivotal US trial for leaflet repair with a clip device. In this study, 279 patients with moderate-to-severe MR (grade 3+ or 4+) were randomly assigned (2:1 ratio) to either percutaneous MV repair with the MitraClip System or to conventional surgical repair/replacement. At 12 months, grade 3+ or 4+ MR was 21% in the percutaneous-repair group and 20% in the surgery group (Figure 3). Both groups had improved LV size, NYHA functional class, and quality-of-life measures compared with baseline [Feldman T et al. *N Engl J Med*. 2011].

Figure 1. Deployment and Placement of Mitral Valve Leaflet Clip

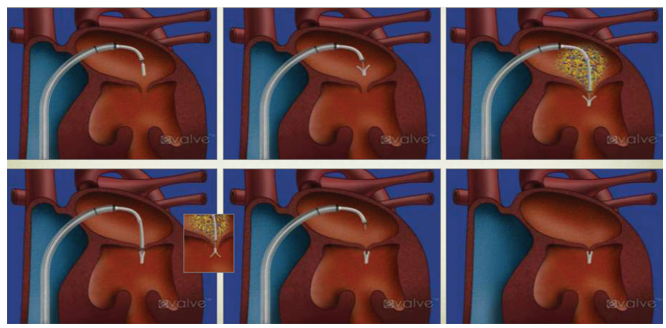

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Figure 2. Mitral Valve Self-Expanding Replacement Device (CardiAQ)

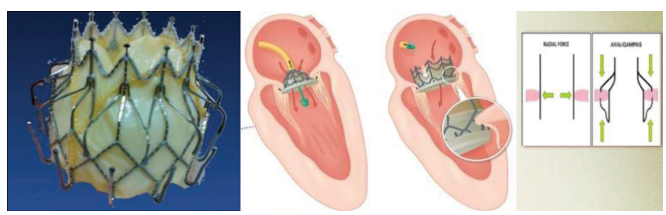

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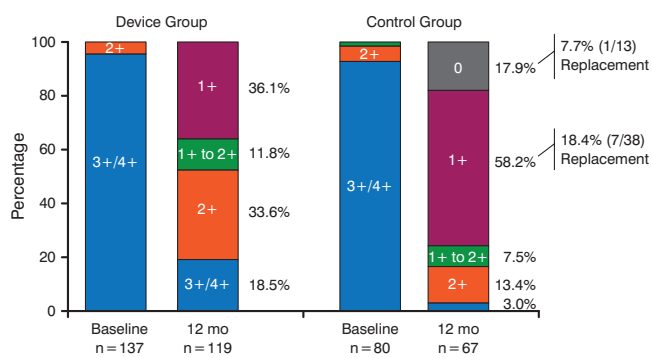
Figure 3. Reduction in Mitral Regurgitation After MitraClip Placement or Surgical Repair



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The COAPT trial [NCT01626079] is currently enrolling participants and is randomizing high-risk patients with functional MR (≥3+)to treatment with either the MitraClip or standard medical care. This trial and its European counterpart, RESHAPE, are expected to evaluate whether there is a role for the MitraClip in patients with functional MR.

Table 1. Contraindications for Percutaneous Mitral Valvuloplasty

Mild mitral stenosis (valve area > 1.5 cm^2)
Left atrial thrombosis
Mitral regurgitation of more than moderate severity
Extensive or bicommissural calcification
Need for open heart surgery on another valve, or coronary arteries, or ascending aorta

Source: Vahanian A, Palacios IF. Percutaneous approaches to valvular disease. *Circulation* 2004;109:1572–1579.

Dr Daggubati also presented a case in which a novel approach was undertaken in a 59-year-old woman with a history of repeated admissions for shortness of breath and 2 prior MV replacements. She was treated off-label with a 26-mm Edwards SAPIEN valve that was deployed into a degenerative bioprosthetic MV. After the procedure, the patient demonstrated no MR or perivalvular leaks, and her cardiac output was 5.2 L/min. Her symptoms improved and she was reclassified from NYHA class IV to NYHA class I.

Mitral stenosis can also be treated with percutaneous mitral valvuloplasty, although Dr Daggubati noted that some conditions are not amenable to percutaneous therapies (Table 1).

In closing, Dr Daggubati noted that there are many forthcoming technologies for treating MR and mitral stenosis. He noted that the PARTNER trial is the current standard upon which other device approvals will be measured although trial methodologies and end points continue to evolve. He feels that improved imaging will accelerate the development of percutaneous MV therapies and that the interaction and collaboration between cardiothoracic surgery and cardiology will help to optimize the utilization of these novel therapies.

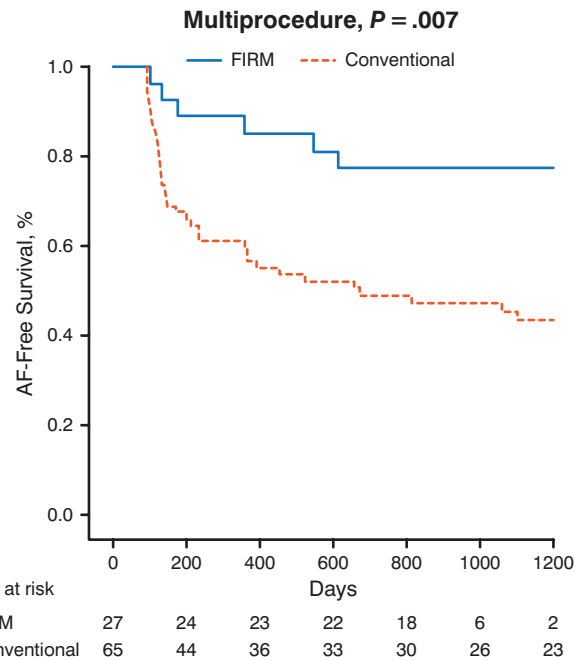
New Cardiac Electrophysiology Treatments for Arrhythmias

Written by Maria Vinall

Mohammad Shenasa, MD, PhD, O'Connor Hospital, San Jose, California, USA, reviewed a few of the new cardiac electrophysiology technologies that are being used in clinical practice.

Three-dimensional mapping technologies, used to facilitate spatial orientation within complex cardiac anatomies, are now being integrated with conventional fluoroscopy imaging. With the use of prerecorded fluoroscopy cine-loops, stored real-time catheter location data can be visualized nonfluoroscopically within a radiographic environment. The speed of the cine-loop is matched to the real-time electrocardiogram signal. Atrial fibrillation (AF) ablation based on this technology reduces radiation exposure and may have a lower complication rate when compared to ablation based on conventional technology [Sommer P et al. *Circ Arrhythm Electrophysiol.* 2014].

Figure 1. Freedom From AF



AF, atrial fibrillation; FIRM, focal impulse and rotor modulation.

Adapted from the *Journal of the American College of Cardiology*, 63, Narayan SM et al, Ablation of Rotor and Focal Sources Reduces Late Recurrence of Atrial Fibrillation Compared With Trigger Ablation Alone: Extended Follow-up of the CONFIRM Trial (Conventional Ablation for Atrial Fibrillation With or Without Focal Impulse and Rotor Modulation), 1761–1768, Copyright (2014), with permission from American College of Cardiology Foundation.

Another new technology, high-density magnetic resonance imaging (MRI)–guided mapping, is particularly useful for mapping sinus node activation. Ablation with MRI-guided mapping has already been done at several institutions and appears safe. MRI interventional suites for mapping and ablation are now available for the specific use of this technique [Eitel C et al. *Eur Heart J.* 2012; Piorkowski C et al. *Circ Arrhythm Electrophysiol*. 2013].

Elimination of patient-specific localized sources of AF by focal impulse and rotor modulation (FIRM) ablation can also terminate or slow the AF while improving outcomes. For instance, FIRM at the inferior left atrial rotor terminates AF to sinus in < 1 minute [Narayan SM et al. *J Am Coll Cardiol.* 2012]. FIRM ablation promotes freedom from AF for up to 3 years when compared with