

4. Wilkoff BL, Fauchier L, Stiles MK, et al. 2015 HRS/EHRA/APHS/SOLAECE expert consensus statement on optimal implantable cardioverter-defibrillator programming and testing. *Heart Rhythm*. 2016;13:e50–e86.
5. Lillo-Castellano JM, Marina-Breyse M, Gómez-Gallanti A, et al. Safety threshold of R-wave amplitudes in patients with implantable cardioverter defibrillator. *Heart*. 2016. <http://heart.bmj.com/content/early/2016/06/13/heartjnl-2016-309295>
6. Akar JG, Bao H, Jones PW, et al. Use of remote monitoring is associated with lower risk of adverse outcomes among patients with implanted cardiac defibrillators. *Circ Arrhythm Electrophysiol*. 2015;8:1173–1180.

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**Selection of the Best of 2016 in Catheter Ablation****Selección de lo mejor del año 2016 en ablación con catéter****To the Editor,**

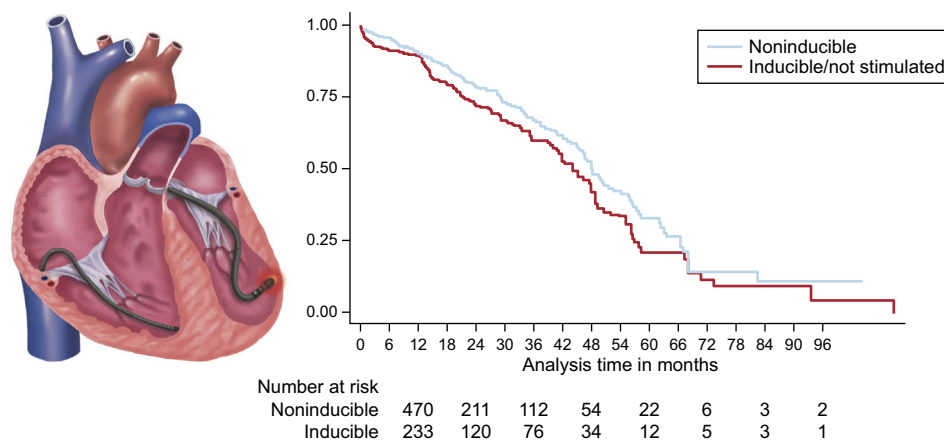
Recent data on catheter ablation approaches and outcomes have provided new clinical perspectives on our main goal of successful arrhythmia termination and lack of recurrences during follow-up.

The results are especially interesting in atrial fibrillation (AF) ablation; this substrate has progressively increased over the last 15 years and is currently the leading procedure in many electrophysiology laboratories in developed countries. The latter highlights the relevance of single-shot approaches vs conventional radiofrequency delivery as an attempt to decrease procedure duration while maintaining the efficacy achieved by conventional point-by-point ablation. Thus, the results of the randomized and multicenter FIRE and ICE trial have shown that cryoballoon ablation was not inferior to radiofrequency ablation with regard to documented recurrence of AF, documented occurrence of atrial flutter or atrial tachycardia, prescription of antiarrhythmic drugs (class I or III), or repeat ablation.<sup>1</sup> Procedure duration was significantly shorter in the cryoablation group than in the radiofrequency group ( $124.4 \pm 39.0$  vs  $140.9 \pm 54.9$  minutes, respectively), although fluoroscopy time was significantly longer in the cryoablation group ( $21.7 \pm 13.9$  vs  $16.6 \pm 17.8$  minutes). Complication rates did not differ between the 2 groups, although 1 case of esophageal ulcer was reported in the cryoablation group. The study only included paroxysmal AF patients, which precluded extrapolating such results to more complex substrates such as persistent AF. Success rates were  $\approx 65\%$  in both groups after a mean

follow-up of 1.5 years, which is close to what has been reported in the presence of continuous rhythm monitoring, when experienced operators perform both techniques.<sup>2</sup>

Despite  $\approx 70\%$  freedom from AF after 1-year of follow-up, the established conventional approach of pulmonary vein isolation (PVI) during AF ablation still shows an important lack of specificity, which precludes increasing efficacy. The latter becomes more relevant with persistent AF, in which the success rate may decrease to 30% after 5 years of follow-up if subsequent procedures upon recurrences are not performed. Data from mechanistically based approaches have been shown to be promising in persistent AF with success rates of up to 77.8% after a median follow-up period of 2.4 years. The main aim of these approaches is to target specific atrial areas that may host rapid reentrant activity. However, it requires processing complex patterns of propagation occurring during AF by means of modern tools and computational analysis that have not been released to the scientific community for proper evaluation. This has generated many concerns among conventional electrophysiology laboratories, especially after the publication of completely different results from the multicenter OASIS trial, which showed poor success rates (14% free of AF/atrial tachycardia-free of antiarrhythmic drugs at 1-year follow-up) using the focal impulse and rotor modulation (FIRM)-guided ablation. However, this work, led by Natale et al. has been recently retracted by the editorial board of the Journal of the American College of Cardiology, due to nondisclosed deviation from a random allocation of participants to treatments across sites. This retraction further sharpens current confusion in the field until new trials are properly conducted.

Another very recent multicenter and randomized trial aimed to compare amiodarone vs AF ablation in challenging substrates, such as persistent AF in patients with left ventricular ejection fraction



**Figure.** Survival in patients with ablated VT. In patients who have experienced a myocardial infarction, catheter ablation can render ventricular tachycardia (VT) noninducible and thereby reduce mortality and VT recurrence. The left panel illustrates catheters positioned in the right ventricle for programmed stimulation and in the left ventricle for ablation of VT within scar tissue. The right panel shows the Kaplan-Meier survival curve for those with noninducible VT compared with those with inducible VT or who did not undergo programmed stimulation. Noninducibility postablation was independently associated with lower mortality (log-rank,  $P = .02$ ). Reproduced with permission from Yokokawa et al.<sup>6</sup>

≤40% and a dual chamber implantable cardioverter defibrillator (ICD) or cardiac resynchronization device (AATAC trial).<sup>3</sup> The ablation strategy went beyond PVI alone and included ablation of extensive areas of the left atrium plus isolation of the superior vena cava in certain cases and redo procedures if necessary. The results showed that catheter ablation was superior to amiodarone in achieving freedom from AF during long-term follow-up. More stunning was that catheter ablation reduced unplanned hospitalizations and overall mortality, which needs to be confirmed in other trials.

Another complex substrate with recent advances leading to clinical implications is ventricular tachycardia (VT) ablation in patients with underlying coronary artery disease and recurrent VT. The prospective, nonrandomized and multicenter Post-Approval THERMOCOOL VT trial has shown that VT ablation significantly reduced sustained monomorphic VT recurrences by 62% at the 6-month follow-up. Moreover, 41% of patients were free from VT after a 3-year follow-up.<sup>4</sup> This outcome translated into a statistically significant decrease in hospitalizations, ICD shocks, and amiodarone use. The ablation approach to identify target sites was left to the investigators' criteria, while recommending activation and entrainment mapping during VT to guide the ablation sites. Substrate characterization by voltage mapping, identification of split or late potentials and/or pace maps with long stimulus to QRS intervals, in which the QRS mimics the target VT, were recommended when VT was intolerable.

Another step forward in VT ablation came from the VANISH trial,<sup>5</sup> which was a multicenter, randomized study aiming to compare catheter ablation with continuation of baseline antiarrhythmic medications or escalated antiarrhythmic drug therapy in patients with prior myocardial infarction, ICD, and recurrent VT. Patients within the antiarrhythmic drug group were treated with amiodarone or amiodarone plus mexiletine. The primary outcome was a composite of death or VT storm or appropriate ICD shock after a 30-day treatment period, including as secondary outcomes all-cause mortality and hospital admissions for cardiac causes, among others. The ablation strategy was similar to that used in the postapproval THERMOCOOL VT trial. Catheter ablation demonstrated to be more effective than antiarrhythmic drug therapy in reducing the primary endpoint after  $27.9 \pm 17.1$  months of follow-up, although mortality did not significantly differ between groups. With respect to mortality, it is likely that this study was underpowered. Large registries indicate that VT ablation, especially in postinfarction patients, appears to reduce mortality if successfully performed (Figure).<sup>6</sup>

The best of catheter ablation in 2016 provides the first evidence of improved outcomes with decreased hospitalizations and possibly also mortality after AF ablation in heart failure patients, and reduced death or VT storms or appropriate ICD shocks after VT ablation in patients with an infarct-related substrate. New imaging

and mapping techniques for both substrates may further improve such outcomes and hopefully improve long-term success in the near future.

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## REFERENCES

- Kuck KH, Brugada J, Furnkranz A, et al. Investigators ICE. Cryoballoon or radiofrequency ablation for paroxysmal atrial fibrillation. *N Engl J Med*. 2016;374:2235–2245.
- Pérez-Castellano N, Fernández-Cavazos R, Moreno J, et al. The COR trial: A randomized study with continuous rhythm monitoring to compare the efficacy of cryoenergy and radiofrequency for pulmonary vein isolation. *Heart Rhythm*. 2014;11:8–14.
- Di Biase L, Mohanty P, Mohanty S, et al. Ablation versus amiodarone for treatment of persistent atrial fibrillation in patients with congestive heart failure and an implanted device: Results from the AATAC multicenter randomized trial. *Circulation*. 2016;133:1637–1644.
- Marchlinski FE, Haffajee CI, Beshai JF, et al. Long-term success of irrigated radiofrequency catheter ablation of sustained ventricular tachycardia: Post-approval THERMOCOOL VT trial. *J Am Coll Cardiol*. 2016;67:674–683.
- Sapp JL, Wells GA, Parkash R, et al. Ventricular tachycardia ablation versus escalation of antiarrhythmic drugs. *N Engl J Med*. 2016;375:111–121.
- Yokokawa M, Kim H, Baser K, et al. Predictive value of programmed ventricular stimulation after catheter ablation of post-infarction ventricular tachycardia. *J Am Coll Cardiol*. 2015;65:1954–1959.

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## Selection of the Best of 2016 in Mechanical Circulatory Support



### Selección de lo mejor del año 2016 en dispositivos de asistencia mecánica circulatoria

#### To the Editor,

Heart failure (HF) is a major health problem that carries high mortality and morbidity.<sup>1</sup> Approximately 5% of patients are in advanced HF and prognosis remains poor. In a small proportion of patients, heart transplant (HT) is an option. Unfortunately, the number of donors is limited, resulting in 250 HT performed per year in Spain. Consequently, mechanical circulatory support with

ventricular assist devices (VADs) has emerged as a treatment option for advanced HF. The type of VAD implanted will depend on the clinical situation defined by the Interagency Registry for Mechanically Assisted Circulatory Support (INTERMACS) classification<sup>2</sup> (Table). The following article aims to select the most important work published in this field in 2015.

The annual report of the Spanish HT registry<sup>3</sup> shows a trend toward an increased use of emergency HT (40% in recent years), with an increasing use of VADs (20%). While long-term continuous-flow VADs are the preferred option in most countries, the most frequently used in Spain are short-term VADs. Peripheral venoarterial extracorporeal membrane oxygenation (ECMO) support is the preferred option in INTERMACS 1. In patients in