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EDITORIAL

Catheter Ablation for Ventricular Tachycardia in Coronary Artery Disease Patients: Is there any Benefit?

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This editorial accompanies the article by Dr Amir Abdel Wahab that describes the results and outcome of ablation of scar related ventricular tachycardia (VT) in a large Canadian centre. The study compares the VT ablation procedure in different aetiologies. This editorial refers only to VT ablation in patients with coronary artery disease and significantly impaired left ventricular function who constituted a large percentage of the patients in his series.

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Coronary artery disease is a prevalent condition that results in loss of myocardium and impairment of left ventricular function with lowering of the ejection fraction. The two possible consequences of a low ejection fraction post infarction, are heart failure and electrical instability leading to ventricular tachycardia. The risk of VT is higher in patients with larger myocardial infarctions and lower ejection fractions, and is highest in the first year after a myocardial infarction (1). The risk of a VT after a myocardial infarction in western countries is currently considered to be around 1% (2). This is considerably lower than previously thought (3-5%) primarily due to modern improvements in acute reperfusion strategies reducing infarct size and preserving LV function. Ventricular tachycardia in the setting of a low ejection fraction can lead to serious hemodynamic consequences and sudden death.

The anatomical substrate for ventricular tachycardia lies within the pathological features of a healed myocardial infarction namely healed myocardial necrosis and scarring. The mechanism of VT in the majority of cases is re-entry and the re-entry circuit is usually related to the edge of the scarred areas (3). The impulses then exit the scar area and depolarise the normal myocardium in the vicinity of the re-entry circuit giving rise to a monomorphic tachycardia that has morphology dependent on the location of the exit point from the re-entry circuit. Catheter ablation should target the re-entry circuit and not only the exit point. There have been many important advances in the understanding and performance of the ablation procedure over the years most notably the advent of advanced electroanatomical imaging and mapping equipment with CARTO magnetic imaging being the leading technology. VT ablation can also be performed with conventional mapping techniques albeit at the expense of significant prolongation of the procedure time and X-ray exposure, and with a lower acute success rate.

Despite advances in VT ablation, implantation of an ICD remains the primary treatment for VT in coronary patients to protect against sudden death, usually with adjunctive antiarrhythmic treatment to suppress ventricular arrhythmias and minimise therapies from the ICD. ICD implantation for secondary prophylaxis after ventricular tachycardia and aborted sudden death has shown an unrivalled and significant survival benefit in all studies when compared to any other intervention (4,5,6,7). The main downside of ICDs is the occurrence of recurrent shocks due to recurrent VT in some patients which may erode patient confidence, cause excessive anxiety and reduce the quality of life. However, in the presence of modern antiarrhythmic drug therapy, heart failure treatment and modern ICD programming, more than 90% of appropriate shocks in these patients can be prevented by anti-tachycardia pacing from the ICD (8,9).

According to the latest ACC/AHA/ESC guidelines in 2006 (10) VT ablation is indicated as adjunctive therapy in patients with structural heart disease and an ICD who are receiving multiple shocks as a result of sustained VT that is not manageable by reprogramming or changing drug therapy or who do not wish long term drug therapy. (Class I indication, Level of Evidence C). However, in different centres around the world, there is a wide variation in the threshold at which the decision to ablate VT is actually made. A common solid indication for catheter ablation is persistent and drug resistant slow ventricular tachycardia that is below the detection range of an ICD and can therefore not be treated with anti-tachycardia pacing.

Despite an impressive acute success rate (rendering one or more clinical VTs non- inducible) ranging from 38% to 79% in different series (11,12) the rates of VT recurrence are disappointing and range in different studies from 19% to

more than 50% (13,14). The recurrent VT may originate from the same re-entry circuit that may break through another exit (if only the exit alone is ablated leaving behind the same or a modified circuit), or a different re-entry circuit as the myocardial substrate allows for the occurrence of multiple re-entry circuits. No studies to date have shown a mortality benefit for VT ablation (+ICD) compared to that afforded by an ICD alone. The main benefit seen with ablation is a reduction in future shocks from the ICD in a large recent study (SMASH-VT) (15). This reduction may be seen either by completely abolishing VT or by modifying the substrate to make it more amenable to drug therapy and anti-tachycardia pacing. However, other studies have failed to demonstrate this beneficial effect and ablation also failed to significantly reduce the risk of VT storm, syncope, hospitalization, or mortality by catheter ablation (16).

VT ablation alone without an ICD is not normally an acceptable treatment option for VT in patients with coronary artery disease and a reduced ejection fraction. This is due to the high recurrence rates discussed above. As any sustained VT in this patient population may be haemodynamically significant and may degenerate to VF and cause sudden death, a recurrence rate of 50% does not afford reliable acceptable protection for these patients. An ICD is therefore indicated in almost all patients and is implanted either before (usually) or after the VT ablation. There are no studies comparing the effect of VT ablation (in the absence of an ICD) on mortality compared to that of medical treatment in this patient population for obvious reasons.

In Egypt and other countries of similar economic standing, the impact of coronary artery disease and acute myocardial infarction is more devastating due to ineffective delivery of reperfusion therapies and the lack of primary PCI availability to the general public. There is therefore a large population of patients who suffer with a low ejection fraction and its consequences including VT. Moreover, only a minority of patients who are indicated for an ICD for secondary prevention actually get one implanted. There is currently no state funding for ICDs in Egypt even in the setting of secondary prevention. The cost of the ICD is prohibitive and beyond the means of the majority of individuals who need it. Drug treatment with beta blockers and amiodarone therefore remain the first line treatment. It is difficult to foresee if/when the cost of ICDs will come down to a practically affordable level.

It is not known from the literature what impact VT ablation alone or in association with antiarrhythmic treatment (amiodarone) would have on the survival of these patients without concurrent use of a defibrillator, compared to amiodarone alone. This remains an area of research that can only be conducted in Egypt or similar countries where socioeconomic factors make the implementation of guidelines difficult. Amiodarone alone has shown little survival benefit in the studies conducted during the past three decades (17,18,19). Would VT ablation for secondary prevention of ischaemic VT add any survival benefit to our patient population who are denied ICDs?

In conclusion, ablation of ventricular tachycardia in coronary patients with a reduced ejection fraction is a complex procedure that requires a lot of expertise. It has a good acute success rate but a high recurrence rate and no demonstrable survival benefit in patients who are already implanted with an ICD. Its current role in the majority of centres is restricted to patients with ICDs and recurrent shocks that cannot be prevented by drug therapy and antitachycardia pacing, a role that has been shown to be effective in reducing the occurrence of appropriate shocks in some but not all studies. Catheter ablation for treatment of VT in patients with a reduced ejection fraction after coronary events therefore sits firmly in third place and comes after ICD implantation and drug treatment in selected patients.

Abbreviations and Acronyms

VT	=	Ventricular Tachycardia
LV	=	Left Ventricular
ICD	=	Implantable Cardioverter Defibrillator

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