Can catheter ablation cure post-infarction ventricular tachycardia?

See page 414, doi: 10.1053/euhj.2001.2804 for the article to which this Editorial refers

The increasing numbers of patients surviving myocardial infarction because of thrombolytic and beta-blocker therapy, has led to a corresponding increase in the patients who suffer ventricular tachycardia remote from their infarction. The undoubted efficacy of palliative treatment with implantable cardiac defibrillator (ICD) therapy\(^1,2\) has been offset by the associated morbidity and costs. It has therefore been a goal of many interventional electrophysiologists to develop a curative percutaneous catheter ablation procedure for such patients. There have been a number of problems associated with catheter ablation particularly of ventricular tachycardia in the setting of coronary disease which in early publications were associated with disappointing rates for long-term cure even in the most experienced hands\(^3\text{-}6\). Among the difficulties associated with post-infarction ventricular tachycardia probably the most important are haemodynamic intolerance of the arrhythmia, production of adequate lesion size, and difficulty identifying the arrhythmia substrate.

Advances in catheter ablation technology for ventricular tachycardia

Catheters with saline-irrigated tips have retained controlled energy delivery while allowing production of larger lesions than conventional catheters\(^7\). Alternatives to radiofrequency energy like laser, ultrasound and percutaneous cryotherapy are also undergoing investigation but before energy can be delivered, localization of the site critical for maintenance of the arrhythmia is required. This is difficult because the electrophysiologist is attempting to manoeuvre a 4 mm tip catheter in a large, complex three-dimensional structure guided by two-dimensional fluoroscopy, in addition to having to localize the relevant portion of diseased myocardium within a large diffusely diseased ventricle. A number of technologies have been developed to facilitate this procedure.

Catheter location systems associated with electro-anatomical magnetic mapping (Carto)\(^8\) and non-contact mapping (Ensite)\(^9,10\) have improved the accuracy of catheter location and reduced the fluoroscopy time. Identification of the arrhythmia substrate has also been improved with the advent of global cardiac mapping systems\(^9,10\). Using such technologies for catheter ablation of post-infarction ventricular tachycardia resulted in success rates of approximately 77% but with low recurrence rates of around 10%. The ability to visualize the arrhythmia action wave front in the intact human heart has also improved our understanding of the mechanisms of post-infarction ventricular tachycardia. With this improved understanding strategies for catheter ablation are changing. An example of this is the application of linear radiofrequency lesions to transect diastolic pathways or enclose ventricular tachycardia exit sites, an approach that has proved useful in patients with haemodynamically unstable ventricular tachycardia\(^8,11\). It has also been apparent that not all diastolic pathways have an endocardial location. This has led some investigators to approach catheter ablation of post-infarction ventricular tachycardia from the epicardium although only limited data have been published\(^12,13\).

Catheter ablation and ICDs

While these advances in technique and technology have improved the success rates and reduced the recurrence rates for post-infarction ventricular tachycardia ablation they have not been tested against ICD therapy, the most effective treatment for prevention of sudden cardiac death. The results of studies comparing palliative treatment with either antiarrhythmic drugs or ICD are well known and have demonstrated that death from cardiac arrhythmia is virtually eliminated in patients with ICD\(^1,2\). Whether the ICD is better than catheter ablation has not been answered. Some studies on small groups of patients have examined the efficacy of new mapping and ablation techniques in ablating post-infarction ventricular tachycardia in patients with ICDs already in situ\(^9,10\). These have demonstrated a significant reduction in the ICD therapy frequency following catheter ablation. However, because these studies were not randomized and involved small groups of patients a comparison in the mortality rate between ICD and catheter ablation patients could not be made.

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The non-randomized prospective study by Della Bella et al. published in this issue[14] has addressed some of these issues. The authors must be congratulated on presenting what is the largest and most comprehensive study of patients with drug-refractory haemodynamically tolerated post-infarction ventricular tachycardia in this era of implantable defibrillators. Although only 30% of their total patient population were suitable for inclusion in this study, this is still a larger proportion than quoted in previous studies (in the region of 10%[4]). Although the criteria for success were stringent (elimination of all ventricular tachycardia) their success rates were comparable with previous studies[6] and an ICD was only implanted if the procedure failed (11%). The mortality rate over the follow-up period was surprisingly low (12%) particularly the sudden death rate (2-6% in those without defibrillator) when one considers that the mean ejection fraction of patients was 34% and that almost 32% of patients had an ejection fraction <30%. According to these data patients who have failed ablation procedures almost certainly warrant an ICD, but even a completely successful ablation did not entirely eliminate the risk of ventricular tachycardia recurrence or sudden death during the follow-up period. Other studies examining the long-term outcome after catheter ablation of post-infarction ventricular tachycardia have demonstrated similar results although they had a different patient population and a larger proportion of patients with defibrillators. Therefore, although the authors conclude that these data support the use of radiofrequency catheter ablation as an alternative to ICD implantation I do not feel that this strategy could be justified until a randomized trial of catheter ablation and ICD has demonstrated comparable efficacy in the two groups.

A number of other interesting questions have been raised by this study. The ablation procedures were performed using conventional techniques and while the results of these procedures were excellent, new mapping and energy delivery technologies may improve the results further. Subgroup analysis of patients according to their cardiac function was not possible but patients with a reasonable left ventricular ejection fraction may be more suitable for a catheter ablation strategy and there are currently studies in progress designed to address this issue. The role of antiarrhythmic drugs in these patients is also unclear. Many patients opt for catheter ablation in the hope that they may be able to stop or at least reduce their antiarrhythmic drugs. In Della Bella’s study[14] and many others, the majority of patients remained on antiarrhythmic drugs, albeit on low doses. Whether catheter ablation will allow the withdrawal of antiarrhythmic drug therapy remains unanswered. A further issue when considering catheter ablation as an alternative to ICD is the possibility of progression of the underlying disease process causing ventricular tachycardia, thereby negating a successful catheter ablation. This is probably important in ventricular tachycardia in the setting of idiopathic cardiomyopathy but may also be a problem in ischaemic heart disease.

The study by Della Bella et al.[14] adds weight to previous studies[6-10] demonstrating the safety and efficacy of catheter ablation in post-infarction ventricular tachycardia. The role of catheter ablation in patients with frequent ICD therapies is not in doubt. However, before catheter ablation can be considered an alternative to ICD implantation a large prospective study of patients randomized to receive catheter ablation using current technology or ICD is needed. The desirability of such a study is supported by the data presented by Della Bella et al.[14], and concerns about the ethics of such a study could also be overcome by implanting ICDs in all patients and programming the ICDs in the catheter ablation group to deliver DC shocks for fast ventricular tachycardia/ventricular fibrillation alone, thus using the ICD as a ‘safety net’.

Many cardiologists may consider that ICDs have rendered catheter ablation of post-infarction ventricular tachycardia obsolete but the increasing burden of device- and drug-related complications we are all observing in our practice still makes curative treatment a desirable goal.

R. J. SCHILLING
St Bartholomew’s Hospital, London, U.K.

References
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