Mainly because of methodological problems, ambulatory ST-monitoring seems to be of limited value for ischaemia screening in hypertrophic cardiomyopathy patients. One exception may be a subgroup of younger patients, but this still remains to be investigated. The ability of the various invasive and non-invasive hypertrophic cardiomyopathy diagnostics used to detect different mechanisms of ischaemia requires further clarification. Objective markers of ischaemia rather than chest pain or dyspnoea should be used to validate such strategies. Each individual hypertrophic cardiomyopathy patient might require the summation of several such tests to elucidate the ischaemia-triggering profile and to explain symptoms. Individual characterization of ischaemia or the division of the heterogeneous hypertrophic cardiomyopathy population into subgroups with similar mechanisms and anatomic substrates will be important to gain understanding of this complex issue.

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References


Optimising radiofrequency catheter ablation of accessory pathways

See page 1072 for the article to which this Editorial refers

The emergence and widespread uptake of catheter ablation techniques using radiofrequency current have revolutionized the treatment of paroxysmal supraventricular tachycardia and the Wolff-Parkinson-White syndrome[1,2]. Although excellent results are consistently reported for ablation of accessory atrioventricular pathways, with success rates over 90% and a low risk of serious complications[3], it is generally acknowledged that a proportion of cases involve lengthy procedures with increased radiation exposure and delivery of multiple myocardial lesions. In view of these limitations, efforts continue to be made to improve both the hardware and methodology used for ablation. Technological advances include the introduction of electrode catheters with a variety of curvatures for easier manipulation, temperature-modulated current delivery, and long vascular sheaths for stabilization on the tricuspid annulus. Attention has also been paid to the endocardial mapping techniques used in the selection of target sites for attempted ablation with a view to restricting the total number of energy deliveries per case, because this is a major determinant of procedure time and fluoroscopic dose. Moreover, the long-term
risks of radiofrequency current application remain unknown, and it would seem prudent to avoid creating unnecessary myocardial lesions until theoretical concerns about the development of late complications such as arrhythmogenesis and coronary artery lesions have been refuted.

Target sites for ablation of bypass tracts are identified from the temporal and morphological characteristics of the local electrogram. Jackman et al.[1] have advocated delivering lesions at sites where an accessory pathway potential can be recorded and verified by programmed stimulation techniques. This rigorous strategy limited the median number of deliveries to three/case but was also very time-consuming with procedure durations averaging around 8 h, presumably because many potentially successful sites were rejected if pathway activation could not be distinguished from the local atrial and ventricular potentials. Accordingly, most electrophysiologists have adopted a pragmatic approach, selecting ablation sites on the basis of simple criteria such as the timing of local ventricular activation relative to delta-wave onset and the presence of possible pathway potentials, but with no attempt specifically to search for or validate such signals. This has shortened average procedure duration to around 2 h, but at the expense of more lesions delivered, typically a median of six to eight/case. Although several groups have proposed (somewhat different) mapping criteria derived from a retrospective analysis of various electrogram parameters, it is unclear if these schemes have resulted in any significant reduction in lesions delivered per case beyond what might be expected from accumulated clinical experience (i.e. 'the learning curve').

In this issue, the study of Xie et al.[5] offers some new insights into how endocardial mapping techniques and criteria are implemented in clinical practice. They examined local electrogram characteristics from a series of 167 patients undergoing successful catheter ablation of bypass tracts, comparing data from 34 cases in which ablation was accomplished by a single lesion and from 133 cases in which multiple lesions (median 7) were required. Comparison of the electrogram characteristics recorded at successful ablation sites in the two groups revealed only minor differences (except among the subset of patients with septal pathways). The main finding was that, in cases where more than one lesion was required, the signals recorded at the first unsuccessful sites of attempted energy delivery were markedly inferior to those obtained at the final successful ablation sites. For pre-excited left free-wall pathways, local ventricular activation fell on average 5.2 ms after delta-wave onset at the initial sites, but preceded delta-wave onset by 3.3 ms at the final sites; local atrioventricular interval was approximately 10 ms longer and no accessory pathway potentials were recorded compared to 40% of the successful sites. Why would experienced electrophysiologists choose to deliver lesions at these apparently unpromising, initial target sites rather than searching for the positions at which more favourable signals were eventually recorded? Procedure duration and fluoroscopy time were closely correlated with the total number of energy deliveries, and it seems unlikely that protracted efforts had been made prior to applying the first lesion. A more plausible explanation is that the electrogram characteristics were over-optimistically interpreted in real time (i.e. during the ablation procedure) compared to the retrospective analysis carried out for the study, due to observer bias. It is only recently that several studies have drawn attention to the poor reproducibility of bipolar electrogram reporting during ablation procedures. For example, de Chillou et al.[6] found that measurement of the time from delta-wave onset to local ventricular activation by experienced observers differed by >10 ms for at least 67% of signals, and by >30 ms for 25% of signals. Subjective discrepancies of this magnitude could easily alter the decision to attempt ablation at a particular site.

How might the confounding influence of observer-dependent variability be limited in clinical practice to avoid delivery of unnecessary lesions? Xie et al. correctly emphasize the importance of maximizing pre-excitation by pacing or drugs to facilitate accurate interpretation of delta-wave onset. There may also be a case for routinely obtaining at least two independent analyses of each signal (perhaps by the cardiologist and a technician) before delivering energy at any site. Finally, most electrophysiologists still rely exclusively on bipolar electrogram recording for endocardial mapping during ablation procedures, although it is widely recognized that it may be difficult to determine local activation accurately if the signal is complex and polyphasic. The clinical utility of unipolar recording from the tip electrode in such cases, for unambiguous timing of ventricular activation, has been established[7] and this simple technique should be routinely used in conjunction with the conventional bipolar mode.

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