

Structural Normality with Ventricular Ectopy: The Horizon Effect.

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The diagnosis and management of patients with very frequent premature ventricular complexes has changed significantly over the past decade, predominantly with the recognition that ectopy may both signify and contribute to underlying cardiac pathology, in conjunction with the potential use and success of electrophysiological ablative therapies.

In their article on this journal (1), Maldonado and colleagues identify a significant proportion of subjects with frequent premature ventricular complexes (PVC's) who previously would have been labeled as having 'structurally-normal hearts' using conventional imaging techniques, but who are found to have underlying cardiac pathologies on cardiovascular magnetic resonance imaging (CMR). Given that the prognosis for patients with frequent PVC's but no underlying cardiac pathology is excellent, management has generally been conservative. In contrast, patients with structural heart disease including cardiomyopathies are thought to have increased risk of sustained ventricular arrhythmias and sudden cardiac death, and therefore are managed more aggressively.

In this study, underlying structural heart disease was detected in more than half of the subjects recruited. The pathologies identified included unsuspected myocarditis, mild systolic dysfunction and subendocardial infarction. Although this range of pathology is more representative of real-world cardiology than has been found in other studies(2), the incidence is also significantly higher. There are likely to be two principal contributory factors to this – firstly that the study incorporated both patients with frequent ventricular ectopy and those with sustained arrhythmias and resuscitated cardiac respiratory arrest were included. Secondly, the detail and tissue characterisation of the CMR imaging performed was greater than in previous studies with specific sequences performed to identify myocardial oedema, fibrosis and infarction.

The value of CMR imaging to aid patient management has been clearly illustrated by data such as the EuroCMR registry(3) (incorporating 27000 patients

across 15 different countries) which showed that it impacted on management in 62% of subjects, and entirely changed diagnosis and management in nearly 10%.

With frequent ventricular ectopy, CMR can also be invaluable in guiding management, however it also raises potential diagnostic and management difficulties. With the advent of even better tissue characterization, including T1 mapping sequences and calculation of extracellular volume, comes the situation where the threshold for normality is continuously rising. As cardiologists, we must recognize that despite this ability to phenotype our patients in ever greater detail, the significance of these, often subtle, findings may be unclear. This can present a conundrum for patient management, illustrated clearly by the outcome data of this study: despite over half of patients having CMR evidence of structural heart disease, no patients with frequent ventricular ectopy had adverse cardiovascular outcomes over the 2 year follow up period. The presence of "structural heart disease" may therefore be much less an "all or none" concept, but a spectrum.

The situation with increasingly capable phenotyping is also matched by the massive reductions in the cost of genotyping. We have reached a point where the wealth of imaging and genetic data obtained, has not been matched by clinical prognostic and evidence-based management data. This is a scenario familiar to interventional cardiologists, who have had the ability to accurately detect coronary artery disease for decades, although quantifying the functional significance of these lesions and predicting prognosis is a relatively new phenomenon.

So where does this leave us with patients presenting with frequent ventricular ectopy? Without doubt, detailed imaging using CMR and tissue characterization will give us, as clinicians, greater confidence with which to reassure patients with normal studies. Similarly, in those patients who fulfil criteria for conditions with a proven risk of life-threatening arrhythmias (such as arrhythmogenic right ventricular cardiomyopathy or hypertrophic cardiomyopathy), appropri-

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ate imaging is aids diagnosis and risk stratification, helping exclude phenocopies. It is in those patients with more potentially more subtle abnormalities such as myocarditis where we need large-scale collaborative longitudinal studies to determine clinical outcome. Single-centre studies are going to struggle to answer these difficult questions where it is important to recruit distinct patient groups with likely low event rates.

From the point of view of the electrophysiologist, CMR may have two additional roles. Firstly, to potentially distinguish between subjects with left ventricular dilatation and impairment secondary to ectopy, and those with ectopy secondary to dilated cardiomyopathy (4) - recent data suggests that the response to ectopy ablation may be similar in the 2 groups (5), but there are wider management issues in DCM. Secondly, there is a growing appreciation of the value of 3-dimensional registration of CMR scar mapping with electroanatomical voltage maps in order to guide the identification of the arrhythmogenic substrate during ablation procedures. (6)

CMR should be an essential tool in the armoury of every cardiologist, and it clearly provides information to cardiologists managing the patient with high burden ventricular ectopy. Maldonado and colleagues have produced data (1) which, as with many studies, potentially generates more questions than answers, and illustrates the increasing blurring of the line between "normal" and "abnormal" with increasingly

capable technology and insights.

Conflicts of interest

None declared

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