EDITORIAL COMMENTARY

What to do when everything fails…Is alcohol the answer?

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When you work so hard all the day long

And everything you do seems to go wrong…

….Let's go get stoned

—*Ray Charles*

A common line of thought in electrophysiology has been to invoke an unreachable site of arrhythmia origin to justify failed ablations. Rather than admit our own shortcomings, we as a community have traditionally fallen for the excuse that an arrhythmia originated from an unreachable location when our efforts failed. "The accessory pathway was epicardial," "the left pulmonary veins had ligament of Marshall connections," "the ventricular tachycardia (VT) came from deep in the muscle" are not unfamiliar phrases to all of us when seeking consolation to our failures. As long as the claimed hypothesized site of origin remained undisprovable, this provided comfort—if not solutions—for us and our patients.

As techniques and technology evolve, more and more of these fallacious lines have been proven untenable and fallen apart when specifically tested. Thus, truly epicardial pathways are rare when the epicardium is mapped,[1–3] as are ligament of Marshall–pulmonary vein connections when the vein of Marshall is mapped.[4]

However, deep intramural substrates, particularly in the context of myocardial scar–based VT, remain a challenge that continues to resist.[5] Intramural VT is arguably our biggest therapeutic challenge. As opposed to atrial fibrillation—a close contender for that honor—in which our lack of full understanding of the arrhythmia mechanisms is the biggest impediment for effective therapies, we have a fairly satisfactory understanding of VT mechanisms. Our shortcomings in VT ablation are chiefly owing to ineffective therapy delivery to protected intramural substrates.[6]

In most cases, such protection can be divided as owing to either anatomical inaccessibility—as in the LV summit—or prior scar (from infarction, inflammation, prior ablations, or postsurgical).

Over the past decade, various approaches have been evaluated for the treatment of ablation-refractory VT. These include simultaneous unipolar[7,8] or bipolar ablation[9,10] from both sides of the intramural substrate, half-normal saline irrigation,[11,12] needle ablation (discontinued by the manufacturer),[13] surgical cryoablation,[14] stereotactic radiation,[15,16] and, more recently, hot-saline needle ablation.[17]

Stojadinović and colleagues[18] present a case that perfectly encapsulates the vicissitudes of dealing with a tough intramural substrate. Their patient combined the anatomical difficulties of the LV summit with the scarring process of an aortic valve replacement. Additionally, previous unipolar endocardial ablation had contributed to additional scarring, despite therapeutic failure. In a sophisticated and experienced laboratory such as Institut Klinické a Experimentální Medicíny's (IKEM's), operators spared no efforts and novel therapies were successively deployed. In a second procedure, bipolar ablation was delivered between 2 catheters on either side of the presumed site of origin—the LV endocardium and the great cardiac vein. Despite no intraprocedural inducibility, VT recurred. The patient then underwent stereotactic body radiation therapy using planning computed tomography and electroanatomical mapping as guidance. On follow-up, the patient was readmitted with VT storm and taken back to the laboratory, where the intramural branches of the great cardiac vein and anterior interventricular vein (first and second septals) were mapped. Using an angioplasty wire as a unipolar electrode, viable myocardium was mapped intramurally, within the previously ablated region. Ethanol delivery in 2 intramural septal veins finally rendered VT uninducible and provided durable success.

The authors should be congratulated for their resilience. The case illustrates the difficulties of intramural ablation in complex substrates as well as the unique strength of IKEM's group. IKEM is one of the few, if not the only laboratory where all these techniques are routinely available for complex patients like this.

Is the lesson here that retrograde coronary venous ethanol ablation (RCVEA) is superior to the other techniques? In my

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opinion, clearly not. What this case illustrates is that RCVEA can succeed when others failed, but this is probably a matter of execution, not a matter of intrinsic value.

All the advanced techniques proposed for intramural techniques have their limitations. Bipolar ablation depends on appropriate positioning of the 2 ablation catheters in the proper location and is subject to the limitations of radiofrequency energy in reaching through scarred tissue and the risks of thermal injury to neighboring structures. Stereotactic body radiation therapy lacks intraprocedural verification of accurate tissue targeting and is subject to errors in dosing and localization. Although it has shown great promise, long-term results have not been uniformly reproduced.[19] Even though radiation effects are well established to be ablative (of targeted tissue, be it myocardium or otherwise), other pleotropic biological effects appear to be operating that could have a role in treatment failures. Finally, RCVEA can provide reproducible success.[20] Although successful in the presented case, it requires an intimate understanding of the LV summit venous anatomy and fluoroscopy,[21] and often requires complex techniques.[22,23] In this case, it was the approach that succeeded, probably because it was the most effectively implemented technique. It is likely that a poorly executed RCVEA could have failed as well.

In most laboratories, only one, if any, of the advanced techniques used in this patient is available. Operators should be familiarized with the technique they have in their hands to maximize its value, and be ready to implement others—or refer patients to other centers—as determined by their expertise or lack thereof. What is unique about RCVEA is that no specialized or expensive equipment is required. Wires and balloons are cheap, as is ethanol, but do require a commitment from the operator to master techniques not routinely used in the electrophysiology laboratory. Once operators invest in the technical mastery of RCVEA, it can become a readily available technique, suitable for even an initial procedure.

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