Evaluation of VT patients-Guidance and safety evaluation in ablation.

Michalis Efremidis, MD

Second Department of Cardiology
Lab of Invasive Cardiac Electrophysiology
Evangelismos General Hospital of Athens
Athens, Greece
Surgeons have the benefit of tactile and visual information for identification of diseased substrates and for measurement of the effect of their procedures. In contrast, cardiac electrophysiologists must use indirect measures for directing catheters to tissues of interest and for measurement of tissue modification. Fluoroscopy provides familiar landmarks and is readily available in all electrophysiology laboratories. It also provides projection imaging.

Analysis of electrograms is an important adjunct of even the simplest anatomic procedures, providing substantial information regarding tissue characteristics and modification after ablation. However, electroanatomic mapping systems have enabled the visualization of electrogram information in the context of 3D anatomy displayed from pre-procedural magnetic resonance (MR), computed tomography, or even positron emission tomography images. The
Ventricular Arrhythmias in the Absence of Structural Heart Disease.
Idiopathic VAs can originate in more than 1 area of the heart but are most common in the outflow tract area nearly 80% of which originate from the right ventricular outflow tract (RVOT).

The frequency of idiopathic VAs with RVOT and pulmonary artery origins is 52%
and that of idiopathic VAs with LVOT, ASC, and epicardial origins is nearly 27%, for a total of 79%
“Evangelismos” EP Lab: Distribution of Idiopathic PVCs

102 pts with Idiopathic PVCs

- 47 pts RVOT (48%)
- 55 pts LVOT (52%)
Novel transitional zone index allows more accurate differentiation between idiopathic right ventricular outflow tract and aortic sinus cusp ventricular arrhythmias
RVOT

Evangelismos EP Lab
Among 278 patients who underwent ablation for idiopathic VT or PVCs arising from the RV, 29 (10%) had VTs/PVCs from the lower RV body.

- 48% of patients had VTs/PVCs arising from the TV area.
- 28% patients had VTs/PVCs arising from the basal RV.
- 24% patients had VTs/PVCs arising from the apical RV.
67 yo

- no structural heart disease

- Transthoracic echocardiography and coronary angiography ruled out structural heart disease.

- Cardiac magnetic resonance imaging (MRI) did not reveal any right ventricular fatty infiltration suggestive of arrhythmogenic ventricular cardiomyopathy (ARVC).

- referred to our hospital for EPS/ablation
Catheter ablation of idiopathic fascicular ventricular tachycardia: The role of isolated diastolic potentials during mapping in sinus rhythm☆

Konstantinos P. Letsas a, Michael Efremidis a, Konstantinos Vlachos a, Dimitrios Asvestas a, Stamatis Georgopoulos a, Sotirios Xydonas a, Kosmas Valkanas a, Antonios Sideris a, Konstantinos Toutouzas b,*, Dimitris Tousoulis b
BACKGROUND  The coronary venous system (CVS) is linked to the origin of idiopathic epicardial ventricular arrhythmias (VAs).

OBJECTIVE  The purpose of this study was to identify the prevalence and effective mapping/ablation strategies for idiopathic VAs mapped to the CVS.

METHODS  Detailed activation and pace-mapping of the right ventricle (RV), left ventricle (LV), CVS, and aortic cusps was performed, followed by attempted catheter ablation.

RESULTS  Forty-seven of 511 patients with non-scar-related VAs (21 males, age 55 ± 15) had earliest activation in the CVS, 39 ± 18 ms before QRS. Twenty-five (53%) were in the great cardiac vein, 19 (40%) in the anterior interventricular vein, and 3 (7%) in the middle cardiac vein. We ablated inside CVS in 32 patients (68%) at the earliest activation site, in 18 patients at an adjacent CVS site, and in 14 patients because of an inability to advance the catheter in 4, inadequate power delivery in 2, and for safer distance from the coronary artery in 8. Proximity to coronaries precluded ablation inside the CVS in the remaining 15 patients (32%), who underwent ablation from adjacent left sinus of Valsalva, RV or LV endocardium, or LV epicardium. Success was achieved in 17 of 18 (94%) ablated at the earliest CVS site and in 16 of 29 (55%) ablated at adjacent CVS or non-CVS sites.

CONCLUSION  Idiopathic VAs are occasionally (9%) linked to CVS. Although ablation at the earliest CVS site is effective, it is often (62%) precluded, mainly because of proximity to coronary arteries. Ablation at adjacent CVS and non-CVS sites can be successful in 55% of these anatomically challenging cases, for an overall ablation success rate of 70%.

KEYWORDS  Ventricular tachycardia; Ventricular premature depolarization; Coronary venous system; Catheter ablation

ABBREVIATIONS  AIV = anterior interventricular vein; CS = coronary sinus; CVS = coronary venous system; GCV = great cardiac vein; LV = left ventricle; MCV = middle cardiac vein; RF = radiofrequency; RV = right ventricle; RVOT = right ventricular outflow tract; VA = ventricular arrhythmia; VPD = ventricular premature depolarization; VT = ventricular tachycardia

(Heart Rhythm 2015:12:1145–1153) © 2015 Heart Rhythm Society. All rights reserved.
Left Ventricular Summit
Catheter Ablation of Ventricular Arrhythmias Arising from the Distal Great Cardiac Vein

Konstantinos P. Letsas, MD, FESC*, Michael Efremidis, MD, Konstantinos Vlachos, MD, Stamatis Georgopoulos, MD, Sotirios Xydonas, MD, Kosmas Valkanas, Antonios Sideris, MD
67 y old male with idiopathic PVCs
69 y old female with PM PVC
34 year old female with idiopathic PVCs

PVC Abolished
A New Combined Parameter to Predict Premature Ventricular Complexes Induced Cardiomyopathy: Impact and Recognition of Epicardial Origin

DAVID HAMON, M.D.*,† MARIE SADRON BLAYE-FELICE, M.D.,‡ JASON S. BRADFIELD, M.D.,† NAJIA CHAACHOUI, M.D.,* RODERICK TUNG, M.D.,† CLAUDE S. ELAYI, M.D.,§ MARMAR VASEGHI, M.D., M.S.,† TARVINDER S. DHANJAL, M.D., Ph.D.,* NOEL G. BOYLE, M.D., Ph.D.,† PHILIPPE MAURY, M.D., Ph.D.,‡ KALYANAM SHIVKUMAR, M.D., Ph.D.,† and NICOLAS LELLOUCHE, M.D., Ph.D.*

J Cardiovasc Electrophysiol, 2016 709-717

**ECG Criteria for an Epicardial PVC origin**

- **Pseudo Δ ≥ 49 ms**
  - **YES**
  - **NO**
  - **Shortest RS ≥ 115 ms**
    - **YES**
    - **q wave in lead aVL**
      - **YES**
      - **EPICARDIAL PVC**
    - **NO**
  - **ENDOCARDIAL PVC**

*Sensitivity = 100%  Specificity = 97.5%*
25 y old female with frequent PVC. Intramural origin
Ventricular arrhythmias in structural heart disease
Value of Cardiac Magnetic Resonance Imaging in Patients With Failed Ablation Procedures for Ventricular Tachycardia

**TABLE 4**
Characteristics of Scar Distribution in Patients with Structural Heart Disease

<table>
<thead>
<tr>
<th>Variables</th>
<th>Coronary Artery Disease</th>
<th>Nonischemic Cardiomyopathy</th>
<th>P-Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Patients, n</td>
<td>8</td>
<td>12</td>
<td></td>
</tr>
<tr>
<td>Scar volume, cm³</td>
<td>17.9 ± 12</td>
<td>17.9 ± 24</td>
<td>1</td>
</tr>
<tr>
<td>Predominant endocardial scar, n</td>
<td>7 (88)</td>
<td>2 (17)</td>
<td>0.006</td>
</tr>
<tr>
<td>Predominant epicardial scar, n</td>
<td>0</td>
<td>4 (33)</td>
<td>0.1</td>
</tr>
<tr>
<td>Predominant intramural scar, n</td>
<td>1 (13)</td>
<td>5 (42)</td>
<td>0.18</td>
</tr>
<tr>
<td>Any intramural scar, n</td>
<td>2 (25)</td>
<td>9 (75)</td>
<td>0.06</td>
</tr>
</tbody>
</table>
Substrate Mapping for VT Ablation: the role of Catheter Design: electrode size and interelectrode spacing

Evangelismos EP Lab
A depolarizing wavefront travels from electrode 1 to electrode 2 with different velocity.
Substrate Mapping for VT Ablation: the role of isthmus delineation

Evangelismos EP Lab
Substrate Mapping for VT Ablation: the role of LP Mapping
Substrate Mapping for VT Ablation: the role of LP Ablation

Evangelismos EP Lab
Thirty-six percent of successful VT ablation sites demonstrated normal voltages (>1.5 mV), but all ablation sites were within the areas of abnormal innervation.
Criteria for Endo or Epicardial Ablation
ECG Criteria to Identify Epicardial Ventricular Tachycardia in Nonischemic Cardiomyopathy

Ermengol Vallès, MD; Victor Bazan, MD; Francis E. Marchlinski, MD

Probable Epicardial Origin (based on interval criteria)

- Presence of inferior q waves?
  - NO
  - YES: No EPI VT

- Pseudo-delta ≥ 75 ms?
  - NO
  - YES: EPI VT

- MDI ≥ 0.59?
  - NO
  - YES: EPI VT

- Presence of q wave in lead I?
  - YES: EPI VT

SN = 96%  SP = 93%
Procedural Outcomes and Survival After Catheter Ablation of Ventricular Tachycardia in Relation to Electroanatomical Substrate in Patients With Nonischemic-Dilated Cardiomyopathy: The Role of Unipolar Voltage Mapping

BORISLAV DINOV, M.D.,* ALEXANDRA SCHRATTER, M.D.,* VALENTINA SCHIRRIPA, M.D., LUKAS FIEDLER, M.D., ANDREAS BOLLMANN, Ph.D., SASCHA ROLF, M.D., PHILIPP SOMMER, M.D., GERHARD HINDRICKS, M.D., and ARASH ARYA, M.D.

![Graphs showing survival analysis and cardiac mortality](image-url)
Noninducibility and Late Potential Abolition
A Novel Combined Prognostic Procedural End Point for Catheter Ablation of Postinfarction Ventricular Tachycardia

John Silberbauer, MA, MD (Res), MRCP; Teresa Oloriz, MD; Giuseppe Maccabelli, MD; Dimitris Tsiachris, MD, PhD; Francesca Baratto, MD; Pasquale Vergara, MD, PhD; Hiroya Mizuno, MD, PhD; Caterina Bisceglia, MD, PhD; Alessandra Marzi, MD; Nicoleta Sora, MD; Fabrizio Guarracini, MD; Andrea Radinovic, MD; Manuela Cireddu, MD; Simone Sala, MD; Simone Gulletta, MD; Gabriele Paglino, MD; Patrizio Mazzone, MD; Nicola Trevisi, MD; Paolo Della Bella, MD

Circ Arrhythm Electrophysiol. 2014;7:424-435
Interventional MRI suite for electrophysiology procedures