Mapping and Catheter Ablation of Idiopathic Ventricular Tachycardia

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There are no conflicts of interest
Ablation of Right Ventricular Outflow Tract Tachycardia in the 90’s
Ablation of Fascicular Tachycardia or Left Ventricle Idiopathic VT in the 90’s
Ablation of Idiopathic Ventricular Tachycardia in 2011

- 1 = classical RVOT
- 2 = tricuspid annulus
- 3 = His-bundle
- 4 = pulmonary artery
- 5 = classical LVOT
- 6 = aortic root (eg, LCC)
- 7 = aortomitral continuity
- 8 = mitral annulus
- 9 = epicardium
- 10 = anterior papillary muscle
- 11 = posterior papillary muscle
- 12 = anterior fascicle
- 13 = posterior fascicle

Catheter Ablation of Idiopathic VT in the 90’s
Ablation of Idiopathic Ventricular Arrhythmias in 2011

Tachycardia-Induced Cardiomyopathy in Patients With Idiopathic Ventricular Arrhythmias

- TICMP was common (1 in every 15 patients)
- Predictors of TICMP
  - male gender
  - absence of symptoms
  - PVC burden of ≥16%
  - persistence of PVCs throughout the day
  - presence of repetitive monomorphous VT

Idiopathic Ventricular Tachycardia

Catheter Ablation

✓ Classic electrophysiological mapping tools still key

✓ Pre-systolic activity
✓ Pace mapping
✓ Entrainment

✓ Electroanatomic mapping
Tachycardia circuit in fascicular VT

Ramprakash B et al. Indian Pacing and Electrophysiology Journal 2008, 8 193-201
Ablation of fascicular VT

RAO view
Ablation of fascicular VT
Ablation of fascicular VT
Ablation of fascicular VT: Anatomical Approach

Ablation of fascicular VT

Extend the lesion set
Idiopathic Focal Ventricular Arrhythmias Originating from the Papillary Muscle in the Left Ventricle

Yamada T (J Cardiovasc Electrophysiol, Vol. 20, pp. 866-872, August 2009)
Ventricular Arrhythmias Originating from the Papillary Muscle

- Focal, nonreentrant mechanism
- QRS width is greater compared with ILVTs (150±15 vs 127±11 ms)
- Activation mapping is useful
- No diastolic potentials during sinus rhythm or VA
- RF catheter ablation is very challenging
- Deep lesions may be necessary
- Recurrence rates are high
- Irrigated RF current can be used
- Postablation follow-up should include echocardiography to rule out mitral regurgitation
Ablation of Classical RV Outflow Tract Arrhythmias

- 25-40 ms
ECG Algorithm of RV-outflow tract

Zhang F – Europace 2009:11:1214-20
Outflow Tract Tachycardias

Outflow Tract Tachycardias

LV outflow tract

Outflow Tract Tachycardias

Pulmonary Artery

Ablation of Idiopathic Ventricular Tachycardia with Left Bundle-Branch Block Morphology Located in the Pulmonary Trunk


Leite LR et al. Arquivos Brasileiros de Cardiologia – Volume 84, Nº 2, Fevereiro 2005
Outflow Tract Tachycardias

Valsalva sinus

LV Outflow Tract Tachycardia
LV Outflow Tract: Poor Signals

ESCOLA PAULISTA DE MEDICINA (UNIFESP) - SERVIÇO DE ELETROFISIOLOGIA

CALIPER RESULTS
VSVD: 10
LV Outflow Tract: Poor pace mapping
Check the aortic cusps
Left coronary cusp mapping

CALIPER RESULTS
PREOCIDAD 42
RF Ablation – Left Valsalva Sinus
RF Ablation – Left Valsalva Sinus
RF Ablation – Left Valsalva Sinus

VD
VSVE

Precocity
QS unipolar pattern

ICE
Angiography
Stable catheter position
Right or Left Outflow Tachycardia?

The V2 Transition Ratio

sensitivity 95%, specificity 100%

Betensky B et al. J Am Coll Cardiol 2011;57:2255–62
Outflow Tract Tachycardias

Epicardial
RV Epicardial VT
Ablation of Left Ventricular Epicardial Outflow Tract Tachycardia From the Distal Great Cardiac Vein

Mapping and Ablation of Epicardial Idiopathic Ventricular Arrhythmias From Within the Coronary Venous System

In 27 of 189 patients (15%) arrhythmia was identified from within the coronary venous system

Success: 74%

Failures due to: low power delivery; phrenic norve or coronary artery proximity

Epicardial ablation successful in 1 of 2 patients

Idiopathic Epicardial Left Ventricular Tachycardia: ECG Predictors

No ECG pattern was specific for epicardial VT

MDI index ≥ 0.55

R-wave width in lead V1 > 75 ms


Idiopathic Ventricular Arrhythmias:
Why did Ablation Fail?

Nonreproducible inducibility
Few ectopics
Catheter ablation of idiopathic left and right ventricular tachycardias in the pediatric population using noncontact mapping

Single-beat mapping in the RVOT

12-year-old boy with RVOT VT

Schneider H et al. Heart Rhythm 2010;7:731–739
VPB

Pace mapping 12/12

Precocity – E-QRS = 36 ms
Idiopathic Ventricular Arrhythmias: Why did Ablation Fail?

Unusual locations
Idiopathic ventricular arrhythmias originating from the tricuspid and mitral annuli

TA near His bundle

Mitral Annulus

Tada H et al. Heart Rhythm 2007;4:7–16)  
Catheter ablation of ventricular arrhythmias originating in the vicinity of the His bundle: Significance of mapping the aortic sinus cusp

Success

Failure

Double check prior to ablation

Idiopathic focal epicardial ventricular tachycardia originating from the crux of the heart

ECG

Epicardial Mapping

Sometimes amenable to ablation within the venous system

Idiopathic Ventricular Arrhythmias: Why did Ablation Fail?

Technical limitations
Assessment of Radiofrequency Ablation Lesions by CMR Imaging After Ablation of Idiopathic Ventricular Arrhythmias

Papillary Muscle PVC

Anterior Fascicle PVCs

DE 19±14 months after ablation

Integration of an ablation lesion into the electroanatomic map

Ig K et al. JACC Img 2010;3:278
Cooling with near-freezing saline improves efficacy of cool-tip radiofrequency catheter ablation

Saline $T=5.8^\circ C$

to increase Power from 16 to 30 W at 30 mL delivery inside GCV

Sternick E et al. Heart Rhythm 2010;7:983–986
A Specific New Catheter for Epicardial Ablation

Fenelon G et al. Heart Rhythm 2011 (abstract)
Ablation of Idiopathic Ventricular Arrhythmias: Conclusion

- The indications for catheter ablation have been expanded over the last decade.

- Excellent results can be achieved in classical forms, but ablation at atypical locations is still challenging.

- ECG features are very useful, however are non-specific. Endocardial mapping remains critical.

- Technical improvements are required, particularly for ablation of arrhythmias originating in the supravalvular region.