Ablative Therapy for Ventricular Tachycardia

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Ventricular Tachycardia

- **Non-sustained ventricular tachycardia (NSVT)**
  - 3 or more consecutive QRS complexes of ventricular origin at rate of more than 100 bpm

- **Sustained VT**
  - Lasts more than 30 seconds, usually requires intervention for termination

- **Monomorphic VT**
  - Uniform QRS configuration

- **Polymorphic VT**
  - Beat to beat variation in QRS configuration

- **Electrical storm**
  - > 3 VT/VF episodes in 24 hours
What is the best treatment option?

1. Catheter Ablation
2. Urgent left heart catheterization
3. Start I/V Amiodarone
4. Do Nothing
Wide Complex Tachycardia: Artifact
Ventricular Tachycardia

- Sudden cardiac arrest (ventricular fibrillation)
- Syncope, near syncope
- Palpitations with wide complex tachycardia (hemodynamically tolerated) or frequent PVCs
Ventricular Tachycardia

- Idiopathic VT
- VT associated with structural heart disease
Idiopathic Ventricular Tachycardia

Polymorphic VT /VF
- Long QT syndrome
- Brugada syndrome
- Short coupled torsades
- Short QT syndrome
- Catecholamine induced polymorphic VT
- Idiopathic VF

Monomorphous VT
- Outflow tract VT- RVOT VT, LVOT VT, cusp VT
- Fascicular VT- LAF, LPF, Septal
- Annular VT- Mitral, Tricuspid
- VT from crux of heart
Right Ventricular Outflow Tract VT
Right Ventricular Outflow Tract VT

Pulmonary valve

Ablation site

Tricuspid valve
Outflow Tract VT
Outflow Tract VT requiring Epicardial Ablation
Outflow Tract VT: Ablation in the Left Aortic Cusp

- Left main coronary artery
- Ablation catheter
Aortic Cusp VT ECG Criteria

- Early transition in precordial leads (V1, V2)
- Notch in V5, lack of S in V5, V6
- Broad R wave in V1, V2
- Larger R/S amplitude in V1, V2
- Notch in V1 in L cusp VT (transseptal conduction)
- Lead I negative in L cusp, positive in R cusp
- Phase analysis (as measured from earliest surface onset)
  - Local onset in V2 ≥ 7 ms
  - Initial peak / nadir in III ≥ 120 ms
  - Initial peak / nadir in V2 ≥ 78 ms
Fascicular VT

- Induction with atrial pacing
- RBBB, LAD
- No structural heart disease (Zipes, 1979)
- Verapamil sensitive (Belhassen, 1981)
- RBBB, RAD (Ohe, 1988)
- Upper septal (Shimoike, 2000)
Left Posterior Fascicular VT

Left Posterior Fascicular VT
Left Anterior Fascicular PVCs
Mitral Annular PVCs / VT

a. Anterolateral

b. Posterior

c. Posterooseptal
1. Septal
   a. Qs in V1
   b. Narrower
   c. No notching

2. Lateral
   a. rS in V1
   b. Wider
   c. Notching
VT arising from the Crux of the Heart
VT arising from the Crux of the Heart
• Idiopathic VT

• VT associated with structural heart disease
3D mapping of LV showing scar in a patient with ischemic cardiomyopathy
Ventricular Tachycardia with Structural Heart Disease

- Coronary artery disease
- Idiopathic dilated cardiomyopathy
- Hypertrophic cardiomyopathy (HOCM)
- Arrhythmogenic right ventricular cardiomyopathy (ARVC)
- Infiltrative cardiomyopathy- amyloidosis, sarcoidosis
- Chagas disease
Ventricular Tachycardia with Structural Heart Disease

- **Congenital heart disease**
  - Tetrology of Fallot, aortic stenosis

- **Valvular heart disease**
  - Pre surgery
  - Post surgical repair

- **Mitral valve prolapse**
  - Right sided AV bundle, fibrotic scars in septum, degenerative changes in conduction system

- **Myotonic dystrophy**
  - AV block more common

- **Familial VT**
  - Genetic abnormality of conduction system
Arrhythmogenic Right Ventricular Cardiomyopathy (ARVC)
ARVC: VT arising from Right Ventricle
Role of imaging modalities in the diagnosis of ARVC

Holter

RV angio

Carto

MRI
Non ischemic Dilated Cardiomyopathy

- Annular scar
- VT arising from the conduction system (bundle branch reentry, fascicular, interfascicular)
- Epicardial scar
Bundle Branch Reentry VT
Catheter Ablation of Right Bundle Branch
Epicardial VT in Patient with Dilated Cardiomyopathy
Epicardial VT

- Chagas 30-40%
- Non ischemic cardiomyopathy 25-50%
- Ischemic cardiomyopathy 10-15%
- ARVC 5-10%
- LV aneurysm, Sarcoid, Non compaction
- Idiopathic VT 10% (mainly around epicardial arteries)
Epicardial Mapping
Epicardial VT: EKG criteria

- QRS duration > 200 ms
- Pseudo delta wave > 34 ms
- Intrinsicoid deflection > 85 ms
- Shortest RS > 121 ms
- Precordial MDI > 0.55 ms
- Non ischemic cardiomyopathy: lack of q wave in inferior leads, positive q wave in lead I
Ventricular Tachycardia

- Ventricular tachycardia is an important cause of sudden cardiac arrest

- ECG characteristics can localize the site and origin of VT

- Idiopathic VT
  - Monomorphic VT / Frequent PVCs curable with catheter ablation
  - Polymorphic VT treated with ICD and drugs

- VT associated with structural heart disease
  - ICD and antiarrhythmic drugs
  - Catheter ablation is mainly palliative, improved efficacy with epicardial mapping, impella/echmo/IABP
Thank you