Purkinje related Ventricular Tachycardia

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In 1845, Johannes Evangelista Purkinje; gelatinous fibers in ventricular subendocardium.

In 1906, Sunao Tawara; Conducting system.
Purkinje related VT

- Left fascicular VT
  1. *Left posterior type*
  2. *Left anterior type*
  3. *Left upper septal type*

- Purkinje fiber mediated VT post infarction

- Bundle-branch reentry and interfascicular reentry VT

- Focal purkinje VT
Fascicular VT

- Most common form of idiopathic left VT
- Mechanism; macro-reentry
- Diagnostic triad by Zipes in 1979
  1. Induction with atrial pacing
  2. RBBB, left axis configuration
  3. Without structural heart disease
     (relative narrow QRS duration)
- Belhassen in 1981; Verapamil sensitivity (verapamil sensitive VT)
Fascicular VT

- **Left posterior type**: most common, 90%
  RBBB, superior axis

- **Left anterior type**: 10%
  RBBB, RAD

- **Left upper septal type**: rare, <1%
  narrow QRS, normal or RAD
ECG of posterior/anterior fascicular VT

Posterior fascicular VT

Anterior fascicular VT
Mechanism

P1: potential of abnormal Purkinje fiber with the decremental property and verapamil sensitivity

P2: potential of normal left posterior fascicle
Catheter position

LAO 35°

RAO 35°
Reentry, decremental property
Reentry, decremental property
Catheter ablation

- Highly successful
- Long term success rate > 90%
- Low incidence of complication
- Considered potential first-line therapy
- Convensional non-irrigated tip catheter
Catheter ablation

1993, Nakagawa, RFCA at earliest presystolic Purkinje potential

Nogami, diastolic potential (P1) is critical potential in the VT circuit. Any P1 in the VT circuit can be targeted for catheter ablation

Apical third of the septum, to avoid LBBB or atrioventricular block

Pacemapping is usually not good.
Catheter ablation

- Mechanical bump
  - Ventricular echo beat, activation mapping

- Empiric anatomic approach
  - VT exit site by pacemapping during sinus rhythm
  - Linear lesion at the midseptum, perpendicular to long axis of LV, 10-15mm proximal to VT exit
  - P1 suddenly appears after QRS complex
Case 1. M/25, posterior fascicular VT
Verapamil iv terminated VT
Catheter position

LAO 35°

RAO 35°
LV angiography
VT induction
Presystolic potential during SR

His d
His m
His p
LV 11,12
LV 9,10
LV 7,8
LV 5,6
LV 3,4
LV 1,2

Presystolic P
P2
His
His
His
Abl; P1 potential, p-QRS 76ms
Termination
Ablation site

LAO 35°

RAO 35°
Mid diastolic potential after abl
Case 2. M/76, anterior fascicular VT
No effect to adenosine, amiodarone
CV 100J restored to SR
Catheter position & LV angiography

LAO 35°

RAO 35°
P1 & P2, activation mapping
Ablation site

LAO 35°

RAO 35°
VT termination within 4 seconds
Frequent PVC, purkinje potential preceding #4 RFCA
Ablation site

LAO 35°

RAO 35°
DDx with PM VT
Conclusions

- ECG criteria may help discriminate fascicular VTs from SVT with aberrancy or other VT
  - Relative narrow QRS duration
  - RBBB with RAD or LAD

- Careful observation of P1 & P2 during mapping

- Earliest Purkinje potential (P2) with diastolic potential (P1)
Thank you!!
# PMVT vs fascicular VT

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<thead>
<tr>
<th></th>
<th>PM VT</th>
<th>Fascicular VT</th>
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<tbody>
<tr>
<td><strong>Manifestation of arrhythmia</strong></td>
<td>Sustained VT &lt; PVC or non-sustained VT</td>
<td>PVC or non-sustained VT &lt; Sustained VT</td>
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<td><strong>Mechanism</strong></td>
<td>Abnormal automaticity or triggered activity</td>
<td>Re-entrant</td>
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<td><strong>ECG during arrhythmia</strong></td>
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<tr>
<td><strong>QRS morphology</strong></td>
<td>RBBB</td>
<td>RBBB</td>
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<tr>
<td><strong>QRS duration</strong></td>
<td>Longer</td>
<td>Shorter</td>
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<tr>
<td><strong>V1</strong></td>
<td>qR or R</td>
<td>rsR’</td>
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<tr>
<td><strong>Q wave in limb leads</strong></td>
<td>(-)</td>
<td>(+)</td>
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<tr>
<td><strong>Response to verapamil</strong></td>
<td>(-)</td>
<td>(+)</td>
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