“Catheter ablation of VT in patients with a structural heart disease”

(Електрофизиологија на срце, процедури и техници)
Catheter ablation of VT in patients with a structural heart disease
-Cardiology unit-6 cath lab
-40 procedures: 10 VT ablations
  9 Afib ablations
  7 SVT ablations
  4 WPW ablations
  4 CRT implantations
  3 ICD implantations
  3 PM implantations

-Tuesday, Wednesday, Thursday morning lectures
Patients with structural heart disease (including prior MI, dilated cardiomyopathy, ARVC/D)

Catheter ablation of VT is recommended
1. for symptomatic sustained monomorphic VT (SMVT), including VT terminated by an ICD, that recurs despite antiarrhythmic drug therapy or when antiarrhythmic drugs are not tolerated or not desired;*
2. for control of incessant SMVT or VT storm that is not due to a transient reversible cause;
3. for patients with frequent PVCs, NSVTs, or VT that is presumed to cause ventricular dysfunction;
4. for bundle branch reentrant or interfascicular VTs;
5. for recurrent sustained polymorphic VT and VF that is refractory to antiarrhythmic therapy when there is a suspected trigger that can be targeted for ablation.

Catheter ablation should be considered
1. in patients who have one or more episodes of SMVT despite therapy with one of more Class I or III antiarrhythmic drugs;*
2. in patients with recurrent SMVT due to prior MI who have LV ejection fraction >0.30 and expectation for 1 year of survival, and is an acceptable alternative to amiodarone therapy;*
3. in patients with haemodynamically tolerated SMVT due to prior MI who have reasonably preserved LV ejection fraction (>0.35) even if they have not failed antiarrhythmic drug therapy.*
“There was consensus among the task force members that catheter ablation for VT should be considered early in the treatment of patients with recurrent VT”
Ventricular Tachycardia Ablation in Coronary Heart Disease

Kuck KH et al. Lancet 2010

107 patients

Interpretation: Prophylactic VT ablation before defibrillator implantation seemed to prolong time to recurrence of VT in patients with stable VT, previous myocardial infarction, and reduced LVEF. Prophylactic catheter ablation should therefore be considered before implantation of a cardioverter defibrillator in such patients.
CONCLUSIONS

In this randomized trial, prophylactic substrate-based catheter ablation reduced the incidence of ICD therapy in patients with a history of myocardial infarction who received ICDs for the secondary prevention of sudden death. (Current Controlled Trials number, ISRCTN62488166.)
VT Diagnosis

Brugada Algorithm

- Absence of an RS complex in all precordial leads? (yes → VT SN=.21 SP=1.0; no → no)
- R to S interval > 100ms in one precordial lead? (yes → VT SN=.66 SP=.98; no → no)
- AV dissociation? (yes → VT SN=.82 SP=.98; no → no)
- Morphology criteria for VT present both in precordial leads V1-2 and V6? (yes → VT SN=.987 SP=.965; no → SVT SN=.965 SP=.987)
Principles to rapidly localize the VT exit site
VT Mechanisms

Abnormal automaticity

Triggered activity

For a given stable VT, differentiating between the three possible mechanisms is challenging

Reentry
Slow conduction perpendicular to the fiber direction in infarcted myocardial tissue is caused by a “zigzag” course of activation at high speed. Activation proceeds along pathways lengthened by branching and merging bundles of surviving myocytes unsheathed by collagenous septa.
<table>
<thead>
<tr>
<th>Fibrosis $\rightarrow$ VT substrate</th>
<th>No Structural Heart Disease</th>
<th>Structural Heart Disease</th>
</tr>
</thead>
<tbody>
<tr>
<td>Endocardial Mapping</td>
<td>$\geq$90%</td>
<td>$&lt;$10% (ILVT)</td>
</tr>
<tr>
<td>Focal VT</td>
<td>$&lt;$10%</td>
<td>$&gt;$90%</td>
</tr>
<tr>
<td>Macro-Reentrant VT</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Tools to define the VT isthmus:
- Activation time mapping
- Pace mapping (during SR)
- Entrainment mapping (during VT)
Electroanatomical mapping

Step # 1 = substrate mapping

- Healthy myocardium
- “Border zone”
- MI “dense scar”

Peri-infarction zone

Core of the infarct
Substrate mapping → Pace mapping

<table>
<thead>
<tr>
<th>Substrate Mapping</th>
<th>Pace Mapping</th>
</tr>
</thead>
<tbody>
<tr>
<td>20 ms S-QRS</td>
<td>20 ms</td>
</tr>
<tr>
<td>40 ms S-QRS</td>
<td>40 ms</td>
</tr>
<tr>
<td>70 ms S-QRS</td>
<td>70 ms</td>
</tr>
<tr>
<td>120 ms S-QRS</td>
<td>120 ms</td>
</tr>
<tr>
<td>140 ms S-QRS</td>
<td>140 ms</td>
</tr>
<tr>
<td>180 ms S-QRS</td>
<td>180 ms</td>
</tr>
</tbody>
</table>
Pace mapping

Entrance

Exit

Short S-QRS

Long S-QRS
# Pace mapping localization

<table>
<thead>
<tr>
<th></th>
<th>Remote site</th>
<th>Outer loop</th>
<th>Adjacent Bystander</th>
<th>Isthmus</th>
</tr>
</thead>
<tbody>
<tr>
<td>PPI - VT CL*</td>
<td>&gt; 30 ms</td>
<td>0-30 ms</td>
<td>&gt; 30 ms</td>
<td>0-30 ms</td>
</tr>
<tr>
<td>12-lead ECG</td>
<td>QRS fusion</td>
<td>QRS fusion</td>
<td>Concealed fusion</td>
<td>Concealed fusion</td>
</tr>
<tr>
<td>St-QRS</td>
<td>Variable</td>
<td>0-20 ms</td>
<td>&gt; 20 ms</td>
<td>0-20 ms</td>
</tr>
</tbody>
</table>
Step # 2 = VT induction & VT mapping
Endocardial reentry > 90% of post-MI mappable VTs

Mid-diastolic late potentials
Step # 3 = VT circuit reconstruction
Step # 4 = VT protected isthmus delineation
Step # 5 = Ablation of isthmus 'transection'

Ablation target = site of entrance of a late potential channel
Conclusions

• Prophylactic catheter ablation reduces the incidence of ICD therapy in patients with prior MI and should be considered early in patients with recurrent VT
• Induce VT then interrupt by PES pacing
• Define the VT isthmus
• Ablate and check for NO further inducibility by PES
• Clinical success  >75% reduction in VT episodes
THANK YOU