Arrhythmias in Acute Coronary Syndrome

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Management concepts to all kinds of arrhythmias during ACS

• Assess and support hemodynamic status
• Resolve or relieve myocardial ischemia
• Correct electrolytes imbalance (esp. K & Mg)
### Mechanisms of VT/VF by the duration after MI

<table>
<thead>
<tr>
<th>Time after MI</th>
<th>Cellular Mechanisms</th>
<th>Arrhythmia Mechanisms</th>
<th>Type of ventricular arrhythmias</th>
</tr>
</thead>
<tbody>
<tr>
<td>2-10 minutes</td>
<td>Changes in membrane potential.</td>
<td>Reentry, automaticity, and triggered activity</td>
<td>PVCs, VT (mono and polymorphic), VF</td>
</tr>
<tr>
<td>10-60 minutes</td>
<td>Irritable myocardium from wall stress and high catecholamines</td>
<td>Automaticity and triggered activity</td>
<td>VT (mono and polymorphic), VF</td>
</tr>
<tr>
<td>1-48 hours</td>
<td>Firing from surviving Purkinje cells</td>
<td>Automaticity</td>
<td>PVCs, NSVT, AIVR</td>
</tr>
<tr>
<td>&gt;48 hours</td>
<td>Scar with the interdigitation of viable myocardium</td>
<td>Reentry (mostly)</td>
<td>Monomorphic VT</td>
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Mechanisms of VT/VF by the duration after MI

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<tr>
<td>Acute Phase  (&lt;48hrs)</td>
<td>Changes in membrane potential.</td>
<td>• แก้ ischemia</td>
<td>All types are reported.</td>
</tr>
<tr>
<td></td>
<td>Irritable myocardium from wall stress and high catecholamines</td>
<td>• แก้ electrolyte imbalances</td>
<td>Polymorphic &gt; monomorphic VT</td>
</tr>
<tr>
<td></td>
<td>Firing from surviving Purkinje cells</td>
<td>• Beta blockers</td>
<td>More VF than in chronic phase.</td>
</tr>
<tr>
<td>Chronic Phase</td>
<td>Scar with the interdigitation of viable myocardium</td>
<td>• ไม่มีผลต่อ long-term prognosis</td>
<td>Need antiarrhythmic agent + High risk of SCD</td>
</tr>
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70F; while being treated for pneumonia in ICU.
Hx of AF, on amiodarone. Potassium 3.1 mEq/L.

- 200J defibrillation
- Correct K and Mg
- Hold amiodarone
- Increase beta blockers
- Coronary angiogram
  - Triple vessel diseases
  - CABG
- No need for ICD at this point.
55M w/ CAD s/p inferior wall STEMI 3 wks ago.

After a 200J cardioversion, ECG is as shown.

Symptomatic monomorphic VT from old infarction.

- ICD for secondary prevention; regardless of LVEF or NYHA class.
- Beta blocker
- Amiodarone
What to do if ventricular arrhythmias keep coming back?

Electrical Storm: The Triggers

» Triggers
  » Ischemia
  » Electrolyte Imbalance
  » Worsening Heart Failure
  » Drug Toxicity
Treatment Option

» Sympathetic blockade with intravenous beta blockers, usually in conjunction with benzodiazepines

» Antiarrhythmic agents

» Overdrive pacing

» General anesthesia

» Intra-aortic balloon counterpulsation

» Stellate ganglionic blockade

» Catheter ablation
Automatic idiopathic ventricular rhythm (AIVR)

- Slower ventricular tachycardia (<120 bpm).
- Not always associated with neither reperfusion nor ischemia.
- Tx: correct electrolytes, ischemia.
- Beta blockers.

Rapid AF with STEMI
- Urgent heart rate slowing is required.
- Consider early cardioversion.
- Anticoagulation is indicated.
  - More bleeding with OAC + P2Y12 inhibitor > OAC + clopidogrel
  - Warfarin vs. NOAC: no clear advantages of either one.
- Single AF episode during ACS: ? Need for OAC
  - Unclear evidence
  - Consider OAC if bleeding risk is low.
Blood supplies of cardiac conduction system

<table>
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<tr>
<th>Structures</th>
<th>Most common blood Supply</th>
<th>Variations</th>
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<tr>
<td>SA node</td>
<td>RCA</td>
<td>LCx or RCA+LCx</td>
</tr>
<tr>
<td>AV node</td>
<td>AV nodal branch from RCA</td>
<td>LCx or RCA+LCx</td>
</tr>
<tr>
<td>His bundle</td>
<td>Septal branch from LAD</td>
<td>RCA or LAD+RCA</td>
</tr>
<tr>
<td>Left anterior fascicle</td>
<td>Septal branch from LAD</td>
<td>RCA (AV nodal branch) or LAD+RCA</td>
</tr>
<tr>
<td>Left posterior fascicle</td>
<td>AV nodal branch from RCA</td>
<td>LAD (septal branch) or RCA+LAD</td>
</tr>
<tr>
<td>Right bundle branch</td>
<td>Septal branch from LAD</td>
<td>RCA (AV nodal branch) or LAD+RCA</td>
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Low grade AV block in inferior STEMI
NSTEMI s/p PCI of LAD 7 days ago. LVEF 40%.

a) Continue to observe
b) Dual chamber pacemaker
c) Cardiac resynchronization therapy

Cardiac Pacing during Acute Coronary Syndrome

- Permanent pacemaker is indicated only if AV block becomes permanent; ie. >7 days after ACS (class I).
- For transient AV block, may consider permanent pacemaker in a patient with advanced conduction defect (ie. Bifascicular block).
- Consider CRT for HFrEF + AV block (class I).
- Temporary pacemaker
  - For significant AV block only
  - Higher risk than non-ACS patients for perforation and tamponade.
CONCLUSIONS

• Tachyarrhythmias
  • Beta blocker is the drug of choices in almost all situations.
  • VT/VF during the acute phase of ischemia is caused by irritable and ischemic myocardium. ICD is not indicated.
  • VT/VF during the chronic phase is related to the scar tissue. Recurrence rate is high. ICD is indicated.
  • No specific treatments for NSVT, PVCs, AIVR.

• Bradyarrhythmias
  • Consider temporary pacemaker in high grade AV block with significant hemodynamic disturbances.
  • Consider permanent pacemaker in persistent AV block.
  • Consider CRT in high grade AV block with HFrEF.

• For all arrhythmias: Correct electrolytes & Ischemia.