Temporary Pacing

Post operative and emergency care
Temporary Pacing

- Indications
- Complications
- Pacemaker care
- Electrical access to the heart
- Electrode configuration
- Pacemaker modes and settings
- Troubleshooting
Indications — Bradyarythmia

• Drug resistant bradycardia

• Mechanical decoupling of the atria and ventricles

• Tachyarrhythmia suppression (eg AF / torsades).

• Prophylactic pacing for high risk procedures
Indications — Tachyarythmia

- AVNRT, AVRT, atrial flutter, VT
- Not for ST, AF or VF
Complications

- Skin burns / CVC complications
- Failure to pace
- Arrhythmia
- Microshock
- Infected wires
- Tamponade
- Myocardial rupture
- Mediastinal haemorrhage
Electrical Access to the Heart

- Transcutaneous
- Transvenous
- Epicardial
- Transoesophageal
Chambers

- Atrial
- Dual Chamber
- Ventricular
- Biventricular
Transvenous Wires
Epicardial Wires
Ventricular
Left & White

Atrial
Right & Blue
Atrial
Blue

Ventricular
White
Electrode Configuration

Unipolar

Bipolar

8 mm
Care of the Wires

- Microshock protection
- Removal
- MRI
Setting The Pacemaker

- Mode
- Rate
- Output
- Sensitivity
Medtronic 5348
Single Chamber
Medtronic 5388
Dual Chamber
Pacing Modes

Naming Convention (the 5 Position Code)

- American Heart Association (AHA)
- American College of Cardiology (ACC)
- North American Society of Pacing and Electrophysiology (NASPE)
- British Pacing and Electrophysiology Group (BPEG)
## 5 Position Code

<table>
<thead>
<tr>
<th>I</th>
<th>II</th>
<th>III</th>
<th>IV</th>
<th>V</th>
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<td>chamber paced</td>
<td>chamber sensed</td>
<td>response</td>
<td>rate modulation</td>
<td>multisite pacing</td>
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<td>I = inhibited</td>
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<td>D = Dual</td>
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5 Position Code

A A I

- paced ventricle
- sensed ventricle
- response inhibited
<table>
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<th>Modes</th>
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<th>Dual Chamber</th>
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<td>D O O</td>
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<td>D V I</td>
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**Single Chamber Asynchronous**

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<td>D 0 0 D D I</td>
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<tr>
<td></td>
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<td>V 0 0 V V D</td>
</tr>
</tbody>
</table>

- **A 0 0**: atrial asynchronous

- Bradycardia with intact AV conduction when sensing is contraindicated

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Danger is AF
Single Chamber Asynchronous

V 0 0
ventricular asynchronous

- Bradycardia without reliable AV conduction when sensing is contraindicated

No atrial kick
Danger is VF
Dual Chamber Asynchronous

D 0 0
ventricular asynchronous

- Bradycardia without reliable AV conduction when sensing is contraindicated.
- Especially in patients in need of the atrial kick

Danger is AF and VF
Single Chamber Sensing

A A I

atrial demand

- Bradycardia with intact AV conduction and detectable atrial rhythm
Single Chamber Sensing

VVI
ventricular demand

- AV conduction problems and no detectable atrial rhythm
- Overdrive suppression of ventricular ectopics

No atrial kick
Dual Chamber Sensing

D V I
AV sequential, ventricular inhibited

- Pacemaker mediated tachycardia

Danger is atrial competition — AF
Dual Chamber Sensing

**DDD**

AV universal

- All indications for pacing with the exception of atrial tachyarrhythmia

Risk of unwelcome ventricular tachycardia
Dual Chamber Sensing

**DDD I**

AV sequential, non-P-synchronous with dual chamber sensing

- As for DDD but more suitable in patients prone to atrial tachyarrhythmia

No increase in VR during appropriate sinus tachycardia
Dual Chamber Sensing

V D D
P-wave synchronous

- Pure AV node disease

Risk of unwelcome ventricular tachycardia
Atrial Pacing — AAI
Ventricular Pacing — VVI
Sensed Pacing — DDD
Rate

- 80 – 100 bpm

- Can be titrated to cardiac output
Output & the Stimulation Threshold

**Stimulation Threshold** is the minimum current necessary to capture and stimulate the heart

- Set pacer rate 10 bpm faster than patient’s HR
- Decrease mA until capture is lost
- Increase output until capture is regained (stimulation threshold)
- Set output to twice the stimulation threshold

Atrial: 5 mA
Ventricular: 10 mA
Stimulation Threshold

**Lower**
- steroids
- Catecholamines
- Hyperoxia
- Hyperkalaemia

**Raise**
- Acidosis
- Hypercapnea
- Hyperglycaemia
- Insulin
- Hypocalcaemia
- Verapamil
- Amiodarone
Failure to Capture
Failure to **Capture**
Failure to **Capture** — Causes

- Insufficient energy delivered by pacer
- Low pacemaker battery
- Dislodged, loose, fibrotic, or fractured electrode
- Electrolyte abnormalities
  - Acidosis
  - Hypoxemia
  - Hypokalemia
Failure to **Capture** — Solutions

- Check connections
- Increase pacer output (↑ mA)
- Change battery, cables, pacer
- Reverse polarity
- Switch to unipolar
Sensitivity & the Sensitivity Threshold

**Sensitivity threshold** is the voltage above which will be considered a myocardial depolarisation.
Sensitivity & the Sensitivity Threshold

Voltage above which will be considered a myocardial depolarisation

- Set pacer rate 10 bpm slower than patient’s heart rate

- Increase sensitivity to chamber being tested to minimum level (0.4 mV)

- Decrease sensitivity of the pacer (↑ mV) to the chamber being tested until pacer stops sensing patient (orange light stops flashing)

- Increase sensitivity of the pacer (↓ mV) until the pacer senses the patient (orange light begins flashing). This is the sensitivity threshold

- Set the sensitivity at ½ the sensitivity threshold

Atrial: 0.4 mV
Ventricular: 2.0 mV
Failure to Sense
Failure to **Sense**
Failure to **Sense**
Failure to **Sense** — Causes

- Pacemaker not sensitive enough to patient's intrinsic electrical activity (mV)
- Insufficient myocardial voltage
- Dislodged lead
- Electrolyte abnormalities
- Low battery
- Malfunction of pacemaker
Failure to **Sense** — Solutions

- Increase pacemaker’s sensitivity (↓ mV)
- Check connections
- Reverse polarity
- Change cables, battery, pacemaker
- Check electrolytes
Oversensing
Other Settings

- AV delay
- Post ventricular atrial refractory period
- VA interval
- Duration of pulse
- Maximum tracking rate
- Blanking periods
Analysing the Underlying Rhythm

Pacemaker (DDD) paused intentionally
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