Arrhythmia recognition and treatment
Contents

- Bradyarrhythmias
- Tachyarrhythmias
- Channelopathies/Cardiomyopathies
Bradyarrhythmias

- Neonates
- Infants/Adolescents
- Pacing
# Neonatal bradyarrhythmias

<table>
<thead>
<tr>
<th>Age</th>
<th>Heart rate 2nd to 98th percentile in bpm (mean)</th>
</tr>
</thead>
<tbody>
<tr>
<td>0-1 days</td>
<td>93-154 (123)</td>
</tr>
<tr>
<td>1-3 days</td>
<td>91-159 (123)</td>
</tr>
<tr>
<td>3-7 days</td>
<td>90-166 (129)</td>
</tr>
<tr>
<td>7-30 days</td>
<td>107-182 (140)</td>
</tr>
<tr>
<td>1-3 months</td>
<td>121-179 (150)</td>
</tr>
</tbody>
</table>
Neonatal bradyarrhythmias

Sinus bradycardia:

- Hypoxia
- Acidosis
- Infection / sepsis
- Electrolyte abnormalities
- Neonatal hypothyroidism
- Increased intracranial pressure
- Hypervagal states- e.g. high position of NG tube, Gastro oesophageal reflux disease
- Obstructive jaundice
Neonatal bradyarrhythmias

Sinus node dysfunction
- Common in ccTGA
- Left atrial isomersim
- Post surgical/intervention
- Long QT
- Drug overdose

Treatment
- Isoprenaline
- Atropine
- Usually self reverting
- Not as significant as AV block
Neonatal bradyarrhythmias

AV block
- Congenital
- Maternal CTD
- Congenital syphilis
- Post surgical
- Long QT syndrome
- Drug overdose

Treatment
- Atropine/isoprenaline
- Pacing if needed
Infant/Adolescent bradyarrhythmias

- Cardiomyopathies/channelopathies become more a problem
- Patients more likely to have multiple congenital interventions
Pacing

Disorders of atrioventricular conduction

Complete congenital atrioventricular block

Class I

(1) Complete congenital atrioventricular block in a newborn or an infant with a ventricular rate 55 b.p.m. or with CHD and a ventricular rate 70 b.p.m. (C)

(2) Complete congenital atrioventricular block with a wide complex escape rhythm, complex ventricular ectopy, or ventricular dysfunction. (B)

(3) Complete congenital atrioventricular block beyond first year of life with an average heart rate 50 bpm, abrupt pauses in ventricular rate 2–3 × basic cycle length, or associated with symptoms of chronotropic incompetence. (B)

Class II

(1) Complete congenital atrioventricular block in asymptomatic children and adolescents with an acceptable rate, a narrow QRS complex and normal ventricular function. (C)

Other non-surgical atrioventricular block

Class I

(1) Advanced second- or third-degree AV block associated with symptomatic bradycardia, ventricular dysfunction, or low cardiac output. (C)

Post-operative atrioventricular block

Class I

1. Post-operative advanced second- or third-degree AV block not expected to resolve or persisting at least 7 days after cardiac surgery. (B)

Class IIb

1. Transient post-operative third-degree AV block with residual bifascicular block. (C)

Sinus node dysfunction

Class I

(1) Sinus node dysfunction with correlation of symptoms during age-inappropriate bradycardia. (B)

Class IIa

1. Asymptomatic sinus bradycardia in children and CHD with resting rate 40 b.p.m. or pauses in ventricular rate .3 s. (C)

2. Sinus node dysfunction with intra-atrial reentrant tachycardia with the need for antiarrhythmics when other therapeutic options, such as catheter ablation, are not possible. (C)

3. Congenital heart disease and impaired haemodynamics due to sinus bradycardia or loss of AV synchrony. (C)

Class IIb

(1) Asymptomatic sinus bradycardia in the adolescent with CHD with resting rate ,40 bpm or pauses in ventricular rate .3 s. (C)

Other indications. Neuromuscular disease associated with AV conduction disease [e.g. myotonic muscular dystrophy, Kearns–Sayre syndrome, Erb dystrophy (limb girdle), peroneal muscular atrophy etc].

Class I

(1) Third-degree or advanced second-degree AV block with or without symptoms. (B)

Class IIb

(1) Any degree of AV block, because the progression of the conduction disease may be unpredictable. (B)

Neurocardiogenic syncope

Class IIb

(1) Significantly symptomatic patients in who prolonged asystole can be demonstrated spontaneously or at tilt-table testing. (C)
### Table 5

The consensus panel recommendations on preferred pacemaker implantation access, pacing modes, and ventricular lead placement in pediatric patients with AV block, systemic LV, and absence of intracardiac shunts

<table>
<thead>
<tr>
<th>Patient size (kg)</th>
<th>Access</th>
<th>Pacing mode</th>
<th>Ventricular lead placement</th>
</tr>
</thead>
<tbody>
<tr>
<td>&lt;10</td>
<td>Epicardial</td>
<td>VVIR</td>
<td>LV apex</td>
</tr>
<tr>
<td></td>
<td>Endocardial—in specific situations (failed epicardial, centre preference)</td>
<td>DDD(R)—in case of a specific haemodynamic indication</td>
<td>RV septum</td>
</tr>
<tr>
<td>10–20</td>
<td>Epicardial</td>
<td>VVIR</td>
<td>LV apex</td>
</tr>
<tr>
<td></td>
<td>Endocardial</td>
<td>DDD(R)—in case of a specific haemodynamic indication</td>
<td>RV septum</td>
</tr>
<tr>
<td>&gt;20</td>
<td>Endocardial</td>
<td>DDD(R)</td>
<td>RV septum</td>
</tr>
<tr>
<td></td>
<td>Epicardial—in specific situations (e.g. concomitant with other cardiac surgery)</td>
<td>VVIR</td>
<td>LV apex or free wall—based on surgical feasibility</td>
</tr>
</tbody>
</table>

AV, atrioventricular; LV, left ventricle; RV, right ventricle
Pacing

- Recognising a problem
- Need to know what system/to which structure
- Remember the pacemaker- is a computer with a massive storage and diagnostic system
Pacing
Pacing
Pacing

Failure to sense in the A wave can reduce the sensitivity-
help the PPM see the P waves
Lead may have displaced slightly
Pacing

Failure to capture
Can increase output
If no success will need new lead/repositioning
Pacing
Tachyarrhythmias

- AVRT
- PJRT
- JET
- Flutter
- Atrial tachycardia
- AVNRT
- VT/ectopy
Tachyarrhythmias
Tachyarrhythmias
Tachyarrhythmias

- AVRT
- Most common source of sustained SVT in neonatal period
- 60% of cases taken for EPS according to EHRA survey
- Degree of pre-excitation dependent on the node/pathway properties
Tachyarrhythmias
Tachyarrhythmias

- Normal management-ABC etc.
- Adenosine reasonable starting point in AVRT-100mcg/kg as a fast bolus with flush- may need to repeat up to 500mcg/kg
- Longterm medical management options include propanolol/flecainide
- Should all be referred to EP for invasive EP study at some point- small risk of sudden death with rapidly conducting pathway-ERP less than 250ms
Tachyarrhythmias

Diagnosis of PJRT
• incessant narrow QRS tachycardia
• negative P waves in inferior leads
• atrioventricular ratio of 1:1.
Tachyarrhythmias
Tachyarrhythmias
Tachyarrhythmias

- NCT- with AV dissociation
- Common under 6 months- almost always post surgical
- Oedema/trauma around the bundle of His
- Common cardiac lesions associated with the development of JET
  - Tetralogy of Fallot (ToF)
  - Ventricular septal defect (VSD)
  - Atrioventricular septal defect (AVSD)
  - Transposition of the great arteries (TGA)
  - Total anomalous pulmonary venous drainage (TAPVD)
- Peri-operative risk factors in the development of JET
  - Infant < 6 month old
  - Long cardiopulmonary bypass and cross-clamp times
  - Extensive myocardial ischaemia/injury (reflected in CK-MB)
  - Transient AV block immediately post cardiopulmonary bypass
  - Postoperative inotropic support, particularly dopamine
  - Acidosis / electrolyte abnormalities, particularly hypomagnesaemia
Tachyarrhythmias

- Treatment: normally resolved by day 8 post op
- Supportive measures: reduce inotropes/cool/fluids and electrolytes
- Sequential pacing
- Amiodarone-Load: 5mg/kg over 1-4 hours and Maintenance infusion of 5-15mg/kg/min
Tachyarrhythmias

Atrial flutter
- Sawtooth P wave pattern in the inferior leads
- Can occur foetally/neontally
- Can be seen post surgically and in conditions with an enlarged right atrium
- Neonatally not likely to be longterm
- AV blocking agents amio/dig/propanolol will slow V rate till flutter terminates
- Cardiovert 1j/2j per kg
- Easy to ablate in adolescents
Tachyarrhythmias

Atrial tachycardia
• Can be focal or macro-re-entrant
• Key is comparison to the sinus p wave
• Rate may not be that fast
• Is particularly problematic in the Fontan group
Tachyarrhythmias

<table>
<thead>
<tr>
<th>Condition</th>
<th>AT</th>
<th>No AT</th>
<th>N</th>
</tr>
</thead>
<tbody>
<tr>
<td>Single ventricle</td>
<td></td>
<td></td>
<td>101</td>
</tr>
<tr>
<td>D-TGA</td>
<td></td>
<td></td>
<td>122</td>
</tr>
<tr>
<td>Pulmonary atresia</td>
<td></td>
<td></td>
<td>53</td>
</tr>
<tr>
<td>Double outlet RV</td>
<td></td>
<td></td>
<td>19</td>
</tr>
<tr>
<td>ccTGA</td>
<td></td>
<td></td>
<td>42</td>
</tr>
<tr>
<td>Tetralogy of Fallot</td>
<td></td>
<td></td>
<td>327</td>
</tr>
<tr>
<td>Eisenmenger</td>
<td></td>
<td></td>
<td>67</td>
</tr>
<tr>
<td>Ebstein</td>
<td></td>
<td></td>
<td>76</td>
</tr>
<tr>
<td>ASD</td>
<td></td>
<td></td>
<td>439</td>
</tr>
<tr>
<td>AVSD</td>
<td></td>
<td></td>
<td>148</td>
</tr>
<tr>
<td>Aortic coarctation</td>
<td></td>
<td></td>
<td>353</td>
</tr>
<tr>
<td>LVOT obstruction</td>
<td></td>
<td></td>
<td>693</td>
</tr>
</tbody>
</table>
Tachyarrhythmias

• Treatment
  ▫ Short lived- can do nothing
  ▫ Can treat with beta-blockers/dig/amiodarone
  ▫ Amenable to catheter ablation
  ▫ In the single ventricle/Fontan group- does constitute an emergency and should be considered for immediate cardioversion
Tachyarrhythmias
Tachyarrhythmias
Tachyarrhythmias

Atrioventricular Nodal Reentrant Tachycardia (AVNRT)

**Alpha Pathway**
- Slow conduction
- Short refractory period
- Time to be able to conduct again

**Beta Pathway**
- Fast conduction
- Long refractory period

Supraventricular
Tachyarrhythmias

- More and more common with age- pre-dominant SVT in adulthood
- Short RP
- Regular
- Often don’t see a P
- Vagal manoeuvres frequently work
- Easily terminated with adenosine
- Can be put on a beta-blocker
Tachyarrhythmias

- Catheter ablation is first choice treatment for long-term cure
Tachyarrhythmias
Tachyarrhythmias
Tachyarrhythmias

- Ectopy common issue
- Not a lot to be done if patient symptomatically ok and heart structurally normal
- Can try to suppress with betablockers/verapamil
- Amenable to catheter ablation if symptomatic on meds/ventricular impairment from high ectopic burden
Channelopathies/Cardiomyopathies

- Long QT
- Brugada
- ARVC
- HCM
- CPVT
Channelopathies/Cardiomyopathies

Need to remember in syncope/epilepsy
Most events seem to occur after the age of 5 with LQT3 presenting latest
### Channelopathies/Cardiomyopathies

<table>
<thead>
<tr>
<th>Recommendations</th>
<th>Class</th>
<th>Level</th>
<th>Ref.</th>
</tr>
</thead>
<tbody>
<tr>
<td>The following lifestyle changes are recommended in all patients with a diagnosis of LQTS:</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>(a) Avoidance of QT-prolonging drugs (<a href="http://www.crediblemedics.org">Http://www.crediblemedics.org</a>).</td>
<td>I</td>
<td>B</td>
<td>434</td>
</tr>
<tr>
<td>(b) Correction of electrolyte abnormalities (hypokalaemia, hypomagnesaemia, hypocalcaemia) that may occur during diarrhoeas, vomiting or metabolic conditions.</td>
<td>I</td>
<td>B</td>
<td>434</td>
</tr>
<tr>
<td>(c) Avoidance of genotype-specific triggers for arrhythmias (steriuous swimming, especially in LQTS1, and exposure to loud noises in LQTS2 patients).</td>
<td>I</td>
<td>B</td>
<td>434</td>
</tr>
<tr>
<td>Beta-blockers are recommended in patients with a clinical diagnosis of LQTS.</td>
<td>I</td>
<td>B</td>
<td>435</td>
</tr>
<tr>
<td>ICD implantation with the use of beta-blockers is recommended in LQTS patients with previous cardiac arrest.</td>
<td>I</td>
<td>B</td>
<td>436–438</td>
</tr>
<tr>
<td>Beta-blockers should be considered in carriers of a causative LQTS mutation and normal QT interval.</td>
<td>IIa</td>
<td>B</td>
<td>67</td>
</tr>
<tr>
<td>ICD implantation in addition to beta-blockers should be considered in LQTS patients who experienced syncope and/or VT while receiving an adequate dose of beta-blockers.</td>
<td>IIa</td>
<td>B</td>
<td>439</td>
</tr>
<tr>
<td>Left cardiac sympathetic denervation should be considered in patients with symptomatic LQTS when</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>(a) Beta-blockers are either not effective, not tolerated or contraindicated;</td>
<td>IIa</td>
<td>C</td>
<td>440</td>
</tr>
<tr>
<td>(b) ICD therapy is contraindicated or refused;</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>(c) Patients on beta-blockers with an ICD experience multiple shocks.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Sodium channel blockers (moxetamine, flecainide or ranolazine) may be considered as add-on therapy to shorten the QT interval in LQTS3 patients with a QTc &gt; 500 ms.</td>
<td>IIb</td>
<td>C</td>
<td>441–443</td>
</tr>
<tr>
<td>Implant of an ICD may be considered in addition to beta-blocker therapy in asymptomatic carriers of a pathogenic mutation in KCNH2 or SCN5A when QTc is &gt; 500 ms.</td>
<td>IIb</td>
<td>C</td>
<td>67</td>
</tr>
<tr>
<td>Invasive EPS with PVS is not recommended for SCD risk stratification.</td>
<td>III</td>
<td>C</td>
<td>117</td>
</tr>
</tbody>
</table>
**Channelopathies/Cardiomyopathies**

Mean age of presentation in children 8 and above 

Need to consider in unexplained syncope 

Treatment of fever is important

<table>
<thead>
<tr>
<th>Recommendations</th>
<th>Class</th>
<th>Level</th>
<th>Ref.</th>
</tr>
</thead>
</table>
| The following lifestyle changes are recommended in all patients with a diagnosis of Brugada syndrome:  
  (a) Avoidance of drugs that may induce ST-segment elevation in right precordial leads (http://www.brugada-drugs.org)  
  (b) Avoidance of excessive alcohol intake and large meals  
  (c) Prompt treatment of any fever with antipyretic drugs. | I     | C     | This panel of experts |
| ICD implantation is recommended in patients with a diagnosis of Brugada syndrome who  
  (a) Are survivors of an aborted cardiac arrest and/or  
  (b) Have documented spontaneous sustained VT. | I     | C     | 451 |
| ICD implantation should be considered in patients with a spontaneous diagnostic type 1 ECG pattern and history of syncope. | IIa   | C     | 451 |
| Quinidine or isoproterenol should be considered in patients with Brugada syndrome to treat electrical storms. | IIa   | C     | 453 |
| Quinidine should be considered in patients who qualify for an ICD but present a contraindication or refuse it and in patients who require treatment for supraventricular arrhythmia. | IIa   | C     | 454 |
| ICD implantation may be considered in patients with a diagnosis of Brugada syndrome who develop VF during PVS with two or three extrastimuli at two sites. | IIb   | C     | 120 |
| Catheter ablation may be considered in patients with a history of electrical storms or repeated appropriate ICD shocks. | IIb   | C     | 201, 455 |
Channelopathies/Cardiomyopathies

Youngest ever reported case is a 7 yr old
Normally present in teenage yrs
# Channelopathies/Cardiomyopathies

<table>
<thead>
<tr>
<th>Recommendations</th>
<th>Class</th>
<th>Level</th>
<th>Ref.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Avoidance of competitive sports is recommended in patients with ARVC.</td>
<td>I</td>
<td>C</td>
<td>388</td>
</tr>
<tr>
<td>Beta-blockers titrated to the maximally tolerated dose are recommended as the</td>
<td>I</td>
<td>C</td>
<td>This panel of experts</td>
</tr>
<tr>
<td>first-line therapy to improve symptoms in patients with frequent PVC and NSVT.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>ICD implantation is recommended in patients with a history of aborted SCD</td>
<td>I</td>
<td>C</td>
<td>389</td>
</tr>
<tr>
<td>and haemodynamically poorly tolerated VT.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Amiodarone should be considered to improve symptoms in patients with frequent</td>
<td>IIa</td>
<td>C</td>
<td>390,</td>
</tr>
<tr>
<td>PVC or NSVT who are intolerant of or have contraindications to beta-blockers.</td>
<td></td>
<td></td>
<td>391</td>
</tr>
<tr>
<td>Catheter ablation, performed in experienced centres, should be considered in</td>
<td>IIa</td>
<td>B</td>
<td>183,</td>
</tr>
<tr>
<td>patients with frequent symptomatic PVC or VT unresponsive to medical therapy</td>
<td></td>
<td></td>
<td>202,</td>
</tr>
<tr>
<td>to improve symptoms and prevent ICD shocks, respectively.</td>
<td></td>
<td></td>
<td>207,</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>392,</td>
</tr>
<tr>
<td>ICD implantation should be considered in ARVC patients who have</td>
<td>IIa</td>
<td>B</td>
<td>387,</td>
</tr>
<tr>
<td>haemodynamically well-tolerated sustained VT, balancing the risk of ICD</td>
<td></td>
<td></td>
<td>394,</td>
</tr>
<tr>
<td>therapy, including long-term complications, and the benefit for the patient.</td>
<td></td>
<td></td>
<td>395</td>
</tr>
<tr>
<td>ICD implantation may be considered in patients with one or more recognized</td>
<td>IIb</td>
<td>C</td>
<td>This panel of experts</td>
</tr>
<tr>
<td>risk factors for VA in adult patients with a life expectancy &gt;1 year following</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>detailed clinical assessment that takes into account the lifelong risk of</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>complications and the impact of an ICD on lifestyle, socioeconomic status and</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>psychological health.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Invasive EPS with PVS may be considered for stratification of SCD risk.</td>
<td>IIb</td>
<td>C</td>
<td>113,</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>114</td>
</tr>
</tbody>
</table>
Channelopathies/Cardiomyopathies

HCM more common in teenagers/young adults
Most common genes are myosin genes
Screening does not normally begin till after 12yrs unless worried
# Channelopathies/Cardiomyopathies

**HCM Risk-SCD Calculator**

<table>
<thead>
<tr>
<th>Risk Factor</th>
<th>Class</th>
<th>Level</th>
<th>Ref.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age (Years)</td>
<td>I</td>
<td>C</td>
<td>366</td>
</tr>
<tr>
<td>Maximum LV wall thickness (mm)</td>
<td>I</td>
<td>B</td>
<td>116, 367–372</td>
</tr>
<tr>
<td>Left atrial size (mm)</td>
<td>I</td>
<td>B</td>
<td>116, 365</td>
</tr>
<tr>
<td>Max LVOT gradient (m/s)</td>
<td>I</td>
<td>B</td>
<td>116, 365</td>
</tr>
<tr>
<td>Family History of SCD</td>
<td>I</td>
<td>B</td>
<td>116, 365</td>
</tr>
<tr>
<td>Non-sustained VT</td>
<td>I</td>
<td>B</td>
<td>116, 365</td>
</tr>
<tr>
<td>Unexplained syncpe</td>
<td>I</td>
<td>B</td>
<td>116, 365</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Risk of SCD at 5 years (%)</th>
<th>ESC recommendation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Risk Score</td>
<td></td>
</tr>
</tbody>
</table>

**Recommendations**

- **Avoidance of competitive sports**: It is recommended in patients with HCM.
- **ICD implantation**: ICD implantation is recommended in patients who have survived a cardiac arrest due to VT or VF or who have spontaneous sustained VT causing syncope or haemodynamic compromise and a life expectancy >1 year.
- **Risk stratification with the HCM**: Risk-SCD calculator is recommended to estimate the risk of sudden death at >5 years in patients ≥16 years of age without a history of resuscitated VT or VF or spontaneous sustained VT causing syncope or haemodynamic compromise.

- **ICD implantation should be considered** in patients with an estimated 5-year risk of sudden death ≥6% and a life expectancy >1 year following detailed clinical assessment that takes into account the lifelong risk of complications and the impact of an ICD on lifestyle, socioeconomic status and psychological health.
- **ICD implantation may be considered** in individual patients with an estimated 5-year risk of SCD of ≥4% to <6% and a life expectancy >1 year following detailed clinical assessment that takes into account the lifelong risk of complications and the impact of an ICD on lifestyle, socioeconomic status and psychological health.
- **ICD implantation may be considered** in individual patients with an estimated 5-year risk of SCD <4% when they have clinical features that are of proven prognostic importance and when an assessment of the lifelong risk of complications and the impact of an ICD on lifestyle, socioeconomic status and psychological health suggests a net benefit from ICD therapy.

**Invasive EPS with PVS is not recommended for stratification of SCD risk.**
Channelopathies/Cardiomyopathies

<table>
<thead>
<tr>
<th>Recommendations</th>
<th>Class</th>
<th>Level</th>
<th>Ref.</th>
</tr>
</thead>
<tbody>
<tr>
<td>The following lifestyle changes are recommended in all patients with a diagnosis of CPVT: avoidance of competitive sports, strenuous exercise and stressful environments.</td>
<td>I</td>
<td>C</td>
<td>This panel of experts</td>
</tr>
<tr>
<td>Beta-blockers are recommended in all patients with a clinical diagnosis of CPVT, based on the presence of documented spontaneous or stress-induced VAs.</td>
<td>I</td>
<td>C</td>
<td>458, 460</td>
</tr>
<tr>
<td>ICD implantation in addition to beta-blockers with or without flecainide is recommended in patients with a diagnosis of CPVT who experience cardiac arrest, recurrent syncope or polymorphic/bidirectional VT despite optimal therapy.</td>
<td>I</td>
<td>C</td>
<td>458, 461</td>
</tr>
<tr>
<td>Therapy with beta-blockers should be considered for genetically positive family members, even after a negative exercise test.</td>
<td>Iia</td>
<td>C</td>
<td>461, 462</td>
</tr>
<tr>
<td>Flecainide should be considered in addition to beta-blockers in patients with a diagnosis of CPVT who experience recurrent syncope or polymorphic/bidirectional VT while on beta-blockers, when there are risks/contraindications for an ICD or an ICD is not available or rejected by the patient.</td>
<td>Iia</td>
<td>C</td>
<td>463</td>
</tr>
<tr>
<td>Flecainide should be considered in addition to beta-blockers in patients with a diagnosis of CPVT and carriers of an ICD to reduce appropriate ICD shocks.</td>
<td>Iia</td>
<td>C</td>
<td>463</td>
</tr>
<tr>
<td>Left cardiac sympathetic denervation may be considered in patients with a diagnosis of CPVT who experience recurrent syncope or polymorphic/bidirectional VT/ several appropriate ICD shocks while on beta-blockers or beta-blockers plus flecainide and in patients who are intolerant or have contraindication to beta-blockers.</td>
<td>Iib</td>
<td>C</td>
<td>464, 465</td>
</tr>
<tr>
<td>Invasive EPS with PVS is not recommended for stratification of SCD risk.</td>
<td>III</td>
<td>C</td>
<td>14</td>
</tr>
</tbody>
</table>