# 2019 ESC Guidelines for the management of patients with supraventricular tachycardia

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**ESC entities having participated in the development of this document:**

**Associations:** Acute Cardiovascular Care Association (ACCA), European Association of Cardiovascular Imaging (EACVI), European Association of Preventive Cardiology (EAPC), European Heart Rhythm Association (EHRA), Heart Failure Association (HFA).

**Councils:** Council for Cardiology Practice.

**Working Groups**: Cardiac Cellular Electrophysiology, Cardiovascular Pharmacotherapy, Cardiovascular Surgery, Development Anatomy and Pathology, Grown-up Congenital Heart Disease.

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# ESC Classes of recommendations

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| | Definition | Wording to use |
|---|---|---|
| Class I | Evidence and/or general agreement that a given treatment or procedure is beneficial, useful, effective. | Is recommended or is indicated |
| Class II | Conflicting evidence and/or a divergence of opinion about the usefulness/efficacy of the given treatment or procedure. | |
| Class IIa | Weight of evidence/opinion is in favour of usefulness/efficacy. | Should be considered |
| Class IIb | Usefulness/efficacy is less well established by evidence/opinion. | May be considered |
| Class III | Evidence or general agreement that the given treatment or procedure is not useful/effective, and in some cases may be harmful. | Is not recommended |





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# ESC Levels of evidence

| | |
|---|---|
| Level of evidence A | Data derived from multiple randomized clinical trials or meta-analyses. |
| Level of evidence B | Data derived from a single randomized clinical trial or large non-randomized studies. |
| Level of evidence C | Consensus of opinion of the experts and/or small studies, retrospective studies, registries. |

# New recommendations in 2019 (1)

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| | |
|---|---|
| Ivabradine alone or in combination with a beta-blocker should be considered in symptomatic patients with inappropriate sinus tachycardia. | IIa |
| i.v. ibutilide may be considered for acute therapy of focal atrial tachycardia. | IIb |
| Ivabradine for postural orthostatic tachycardia syndrome, and ivabradine with a beta-blocker for chronic therapy of focal atrial tachycardia, may be considered. | IIb |
| Patients with atrial flutter without AF should be considered for anticoagulation but the threshold for initiation is not established. | IIa |
| i.v. ibutilide or i.v. or oral (in-hospital) dofetilide are recommended for conversion of atrial flutter. | I |





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# New recommendations in 2019 (2)

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| | |
|---|---|
| High-rate atrial pacing is recommended for termination of atrial flutter in the presence of an implanted pacemaker or defibrillator. | I |
| i.v. amiodarone is not recommended for pre-excited AF. | III |
| Performance of an EPS to risk stratify individuals with asymptomatic pre-excitation should be considered. | IIa |
| Catheter ablation is recommended in asymptomatic patients in whom EP testing with the use of isoprenaline identifies high risk properties, such as SPERRI ≤250 ms, AP ERP ≤250 ms, multiple APs, and inducible AP-mediated tachycardia. | I |





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(European Heart Journal; 2019)

# New recommendations in 2019 (3)

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| | |
|---|---|
| Non-invasive evaluation of the conducting properties of the AP in individuals with asymptomatic pre-excitation may be considered. | IIb |
| Catheter ablation may be considered in a patient with asymptomatic pre-excitation, and low risk AP at invasive or non- invasive risk stratification. | IIb |
| Catheter ablation should be considered in patients with asymptomatic pre-excitation and left ventricular dysfunction due to electrical dyssynchrony | IIa |
| AV nodal ablation with subsequent pacing ("ablate and pace") either biventricul or His-bundle pacing, is recommended if a tachycardia responsible for tachycardiomyopathy cannot be ablated or controlled by drugs. | I |





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# New recommendations in 2019 (4)

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| | |
|---|---|
| During the first trimester of pregnancy it is recommended to avoid all antiarrhythmic drugs, if possible. | I |
| In pregnant women, beta-1 selective (except atenolol) or verapamil, in order of preference, should be considered for prevention of SVT in patients without WPW syndrome. | IIa |
| In pregnant women, flecainide or propafenone should be considered for prevention of SVT in patients with WPW syndrome and without ischaemic or structural heart disease. | IIa |

# New revised concepts

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- Drug therapy for inappropriate sinus tachycardia and focal atrial tachycardia.
- Therapeutic options for acute conversion and anticoagulation of atrial flutter.
- Therapy of AVNRT.
- Therapy of antidromic AVRT and pre-excited AF.
- Management of patients with asymptomatic pre-excitation.
- Diagnosis and therapy of tachycardiomyopathy.

# Conventional classification of supraventricular tachycardias (1)

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## Atrial tachycardias

Sinus tachycardia
- Physiological sinus tachycardia
- Inappropriate sinus tachycardia
- Sinus nodal re-entrant tachycardia

Focal atrial tachycardia

Multifocal atrial tachycardia

Macro-re-entrant atrial tachycardia (MRAT)

# Conventional classification of supraventricular tachycardias (2)

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## Atrial tachycardias

- Cavotricuspid isthmus-dependent MRAT
  - Typical atrial flutter, counter-clockwise (common) or clockwise (reverse)
  - Other cavotricuspid isthmus-dependent MRAT
- Non-cavotricuspid isthmus-dependent MRAT
  - Right atrial
  - Left atrial

Atrial fibrillation

# Conventional classification of supraventricular tachycardias (3)

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**Atrioventricular junctional tachycardias**

Atrioventricular nodal re-entrant tachycardia
- Typical
- Atypical

Non-re-entrant junctional tachycardia
- Junctional ectopic tachycardia (focal junctional tachycardia)
- Other non-re-entrant variants

**Atrioventricular re-entrant tachycardias**

- Orthodromic (including permanent junctional reciprocating tachycardia)
- Antidromic (with retrograde conduction through the atrioventricular node or, rarely, over another pathway)

# Differential diagnosis of narrow and wide QRS tachycardias (1)

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## Narrow QRS (≤120 ms) tachycardias

*Regular*

- Physiological sinus tachycardia
- Inappropriate sinus tachycardia
- Sinus nodal re-entrant tachycardia
- Focal atrial tachycardia
- Atrial flutter with fixed AV conduction
- AV nodal re-entrant tachycardia
- Junctional ectopic tachycardia (or other non-re-entrant variants)
- Orthodromic AV re-entrant tachycardia
- Idiopathic VT (especially high septal VT)

# Differential diagnosis of narrow and wide QRS tachycardias (2)

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## Narrow QRS (≤120 ms) tachycardias

*Irregular*

- AF
- Focal atrial tachycardia or atrial flutter with varying AV block
- Multifocal atrial tachycardia

# Differential diagnosis of narrow and wide QRS tachycardias (3)

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## Wide QRS (>120 ms) tachycardias

*Regular*

- Ventricular tachycardia / flutter
- Ventricular paced rhythm
- Antidromic AV re-entrant tachycardia
- Supraventricular tachycardias with aberration / bundle branch block (pre-existing or rate-dependent during tachycardia)
- Atrial or junctional tachycardia with pre-excitation / bystander accessory pathway
- Supraventricular tachycardia with QRS widening due to electrolyte disturbance or antiarrhythmic drugs

# Differential diagnosis of narrow and wide QRS tachycardias (4)

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## Wide QRS (>120 ms) tachycardias

*Irregular*

- AF or atrial flutter or focal atrial tachycardia with varying block conducted with aberration
- Antidromic AV re-entrant tachycardia due to a nodo-ventricular/ fascicular accessory pathway with variable VA conduction.
- Pre-excited AF
- Polymorphic VT
- Torsade de pointes
- Ventricular fibrillation

Occasionally, AF with very fast ventricular response may apparently resemble a regular narrow-QRS tachycardia.

# Initial evaluation of the patient with SVT

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| Standard |
| --- |
| •History, physical examination, and 12-lead ECG<br>•Full blood count, biochemistry profile, and thyroid function<br>•An ECG during tachycardia should be sought<br>•Transthoracic echocardiography |
| **Optional** |
| •Exercise tolerance testing<br>•24 h ECG monitoring, trans-telephonic monitoring, or an implantable loop recorder<br>•Myocardial ischaemia testing in patients with coronary artery disease risk factors (including men >40 years and post-menopausal women)<br>•An EPS should be considered for a definitive diagnosis and when catheter ablation is anticipated |





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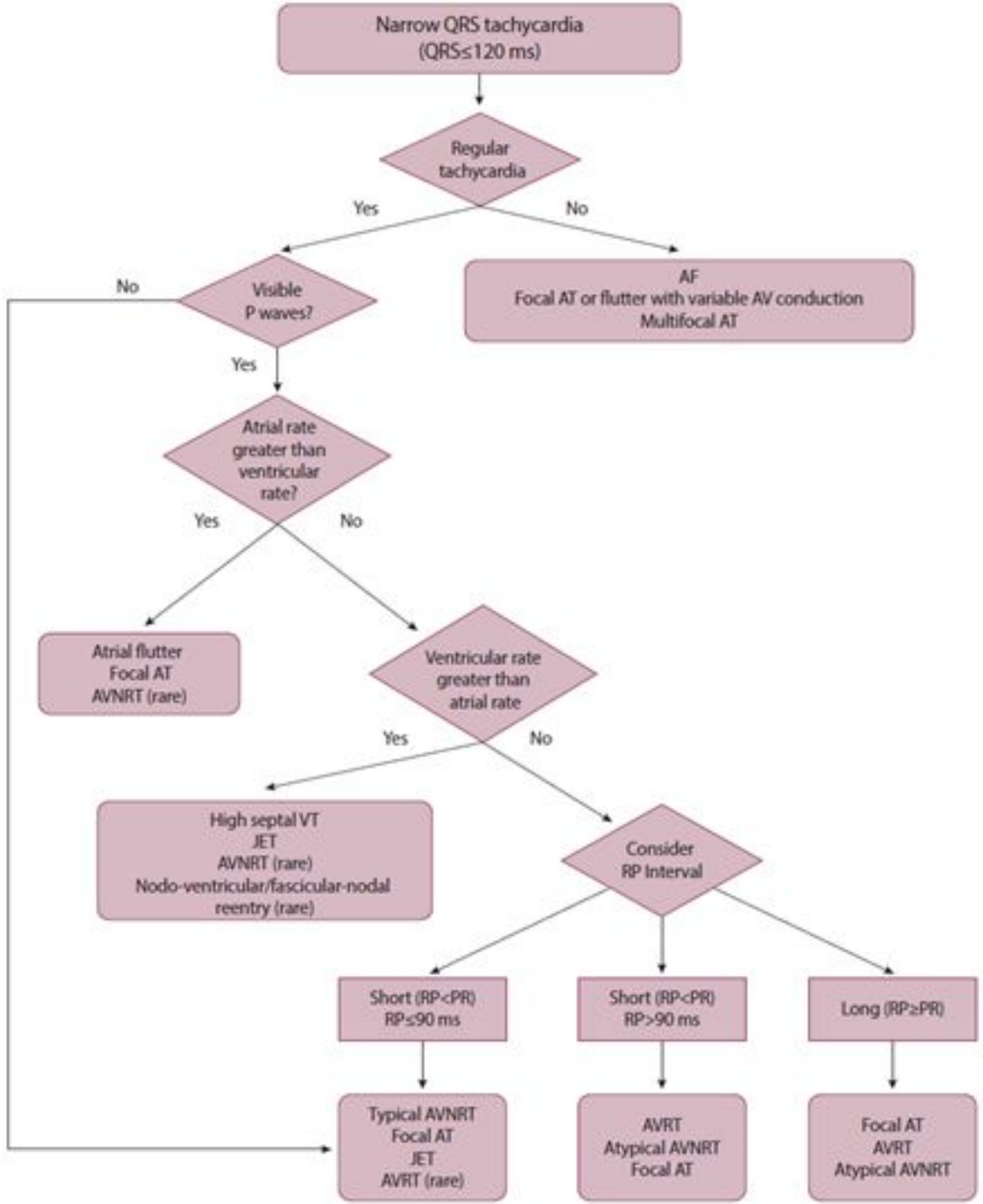


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# Differential diagnosis of narrow QRS tachycardia



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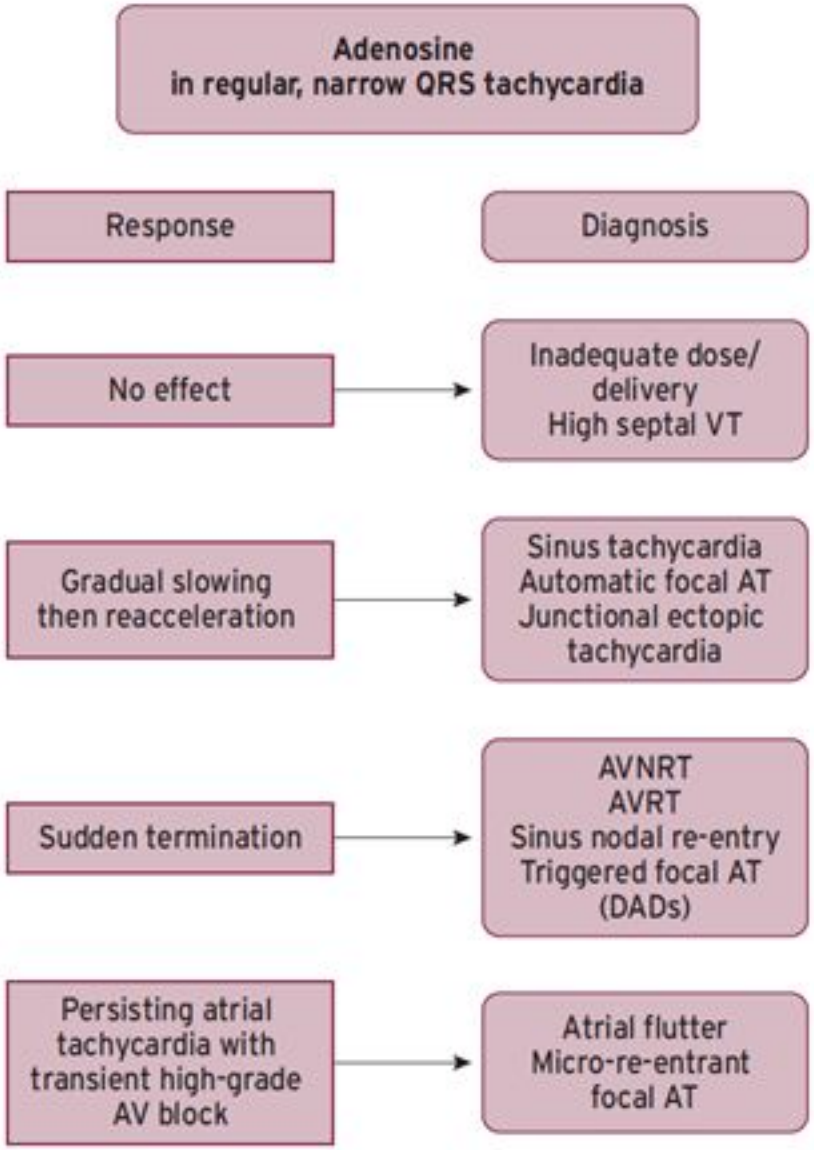
# Possible responses of narrow QRS tachycardia to adenosine

(1) Slowing of AVN conduction and induction of intermittent AV block. Atrial electrical activity can thus be unmasked, revealing dissociated P waves (focal AT, atrial flutter, or AF waves).

(2) Temporary decrease in the atrial rate of automatic tachycardias (focal AT, sinus tachycardia, and JET).

(3) Tachycardia termination. This can happen by interrupting the reentry circuit in AVNRT and AVRT by acting on the AVN that is part of the circuit. More rarely, sinus nodal re-entry and ATs due to triggered activity can slow down and terminate.

(4) No effect is observed in some cases.




# Responses of narrow complex tachycardias to adenosine





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# Summary of key ECG criteria that suggest VT rather than SVT in wide complex tachycardia (1)

| | |
|---|---|
| **AV dissociation** | Ventricular rate > atrial rate |
| **Fusion/capture beats** | Different QRS morphology from that of tachycardia |
| **Chest lead negative concordance** | All precordial chest leads negative |
| **RS in precordial leads** | •Absence of RS in precordial leads<br>•RS >100 ms in any lead* |

*: RS: beginning of R to deepest part of S

# Summary of key ECG criteria that suggest VT rather than SVT in wide complex tachycardia (2)

| | |
|---|---|
| **QRS complex in aVR** | •Initial R wave<br>•Initial R or Q wave >40 ms<br>•Presence of a notch of a predominantly negative complex |
| **QRS axis -90° to ± 180°** | Both in the presence of RBBB and LBBB morphology |
| **R wave peak time in lead II** | R wave peak time ≥50 ms |

# Summary of key ECG criteria that suggest VT rather than SVT in wide complex tachycardia (3)

| | |
|---|---|
| **RBBB morphology** | ***Lead V1:*** Monophasic R, Rsr', biphasic qR complex, broad R (>40 ms), and a double- peaked R wave with the left peak taller than the right (the so-called rabbit ear sign)<br>***Lead V6:*** R:S ratio <1 (rS, QS patterns) |
| **LBBB morphology** | ***Lead V1:*** Broad R wave, slurred or notched down stroke of the S wave, and delayed nadir of S wave<br>***Lead V6:*** Q or QS wave |

# Recommendations for the acute management of narrow QRS tachycardia in the absence of an established diagnosis (1)

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| Recommendations | Class | Level |
|---|---|---|
| **Haemodynamically unstable patients** | | |
| Synchronized direct-current cardioversion is recommended for haemodynamically unstable patients. | I | B |
| **Haemodynamically stable patients** | | |
| A 12-lead ECG during tachycardia is recommended. | I | C |
| Vagal manoeuvres, preferably in the supine position with leg elevation, are recommended. | I | B |
| Adenosine (6–18 mg i.v. bolus) is recommended if vagal manoeuvres fail. | I | B |





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# Recommendations for the acute management of narrow QRS tachycardia in the absence of an established diagnosis (2)

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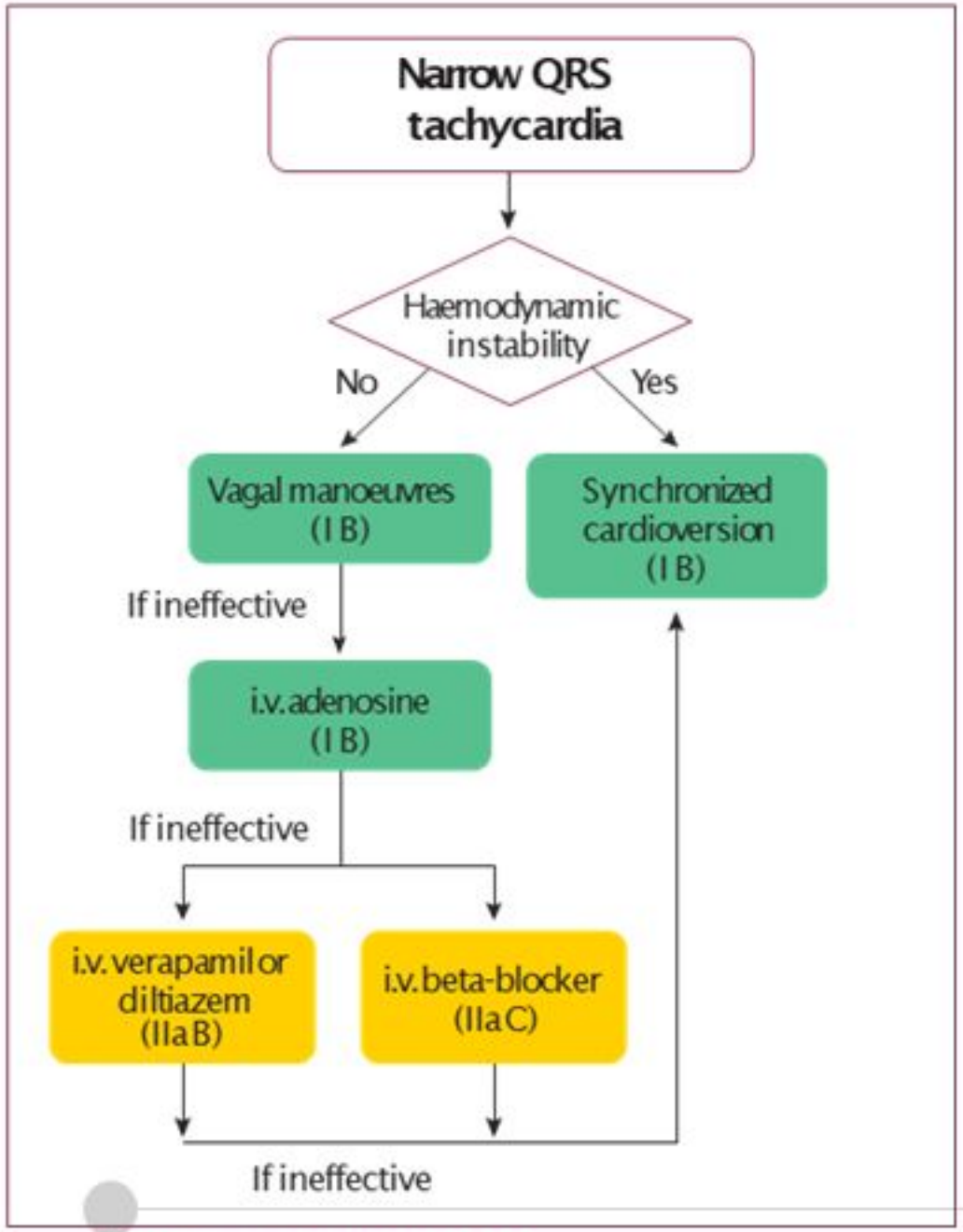
| Recommendations | Class | Level |
|---|---|---|
| **Haemodynamically stable patients** | | |
| i.v. verapamil or diltiazem should be considered if vagal manoeuvres and adenosine fail | IIa | B |
| i.v. beta-blockers (esmolol or metoprolol) should be considered if vagal manoeuvres and adenosine fail. | IIa | C |
| Synchronized direct-current cardioversion is recommended when drug therapy fails to convert or control the tachycardia. | I | B |

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# Acute therapy of narrow QRS tachycardia in the absence of an established diagnosis

# Recommendations for the acute management of wide QRS tachycardia in the absence of an established diagnosis (1)

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| Recommendations | Class | Level |
|---|---|---|
| **Haemodynamically unstable patients** | | |
| Synchronized direct-current cardioversion is recommended in haemodynamically unstable patients. | I | B |
| **Haemodynamically stable patients** | | |
| A 12-lead ECG during tachycardia is recommended. | I | C |
| Vagal manœuvres, preferably in the supine position with leg elevation,are recommended. | I | C |
| Adenosine should be considered if vagal manoeuvres fail, and there is no pre-excitation on a resting ECG. | IIa | C |
| i.v. procainamide should be considered if vagal manoeuvres and adenosine fail. | IIa | B |

# Recommendations for the acute management of wide QRS tachycardia in the absence of an established diagnosis (2)

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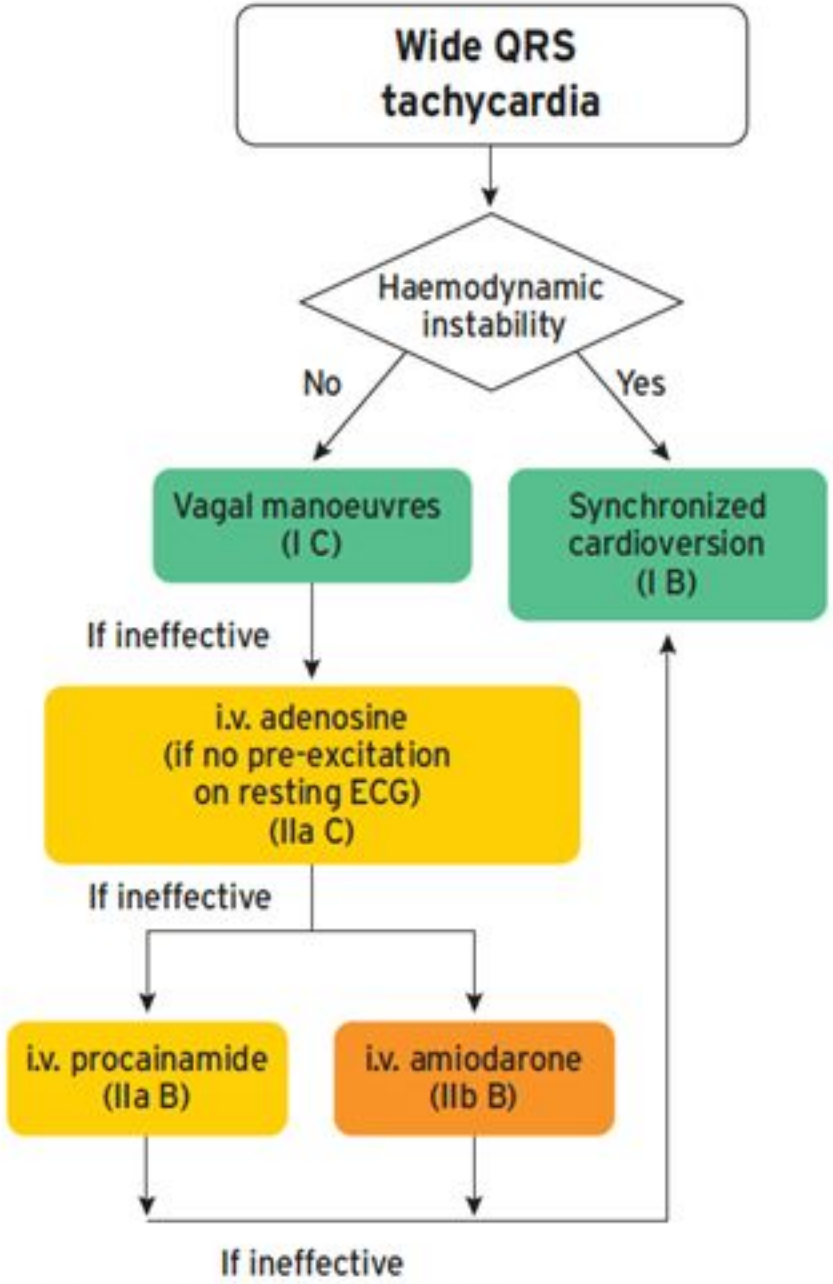
| Recommendations | Class | Level |
|---|---|---|
| **Haemodynamically stable patients** | | |
| i.v. amiodarone may be considered if vagal manoeuvres and adenosine fail. | IIb | B |
| Synchronized direct-current cardioversion is recommended if drug therapy fails to convert or control the tachycardia. | I | B |
| Verapamil is not recommended in wide QRS complex tachycardia of unknown aetiology. | III | B |

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# Acute therapy of wide complex tachycardia in the absence of an established diagnosis



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# Average success and complications rates of catheter ablation for SVT

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| | Acute success (%) | Recurrence (%) | Complications (%) | Mortality (%) |
|---|---|---|---|---|
| Focal AT | 85 | 20 | 1.4[a] | 0.1 |
| CTI-dependent atrial flutter | 95 | 10 | 2[b] | 0.2 |
| AVNRT | 97 | 2 | 0.3[c] | 0.01 |
| AVRT | 92 | 8 | 1.5[d] | 0.1 |





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(European Heart Journal; 2019)

# Causes of physiological sinus tachycardia

| | |
|---|---|
| **Physiological causes** | Emotion, physical exercise, sexual intercourse, pain, pregnancy |
| **Pathological causes** | Anxiety, panic attack, anaemia, fever, dehydration, infection, malignancies, hyperthyroidism, hypoglycaemia, pheochromocytoma, Cushing's disease, diabetes mellitus with evidence of autonomic dysfunction, pulmonary embolus, myocardial infarction, pericarditis, valve disease, congestive heart failure, shock. |
| **Drugs** | Epinephrine, norepinephrine, dopamine, dobutamine, atropine, beta-2 adrenergic receptor agonists (salbutamol), methylxanthines, doxorubicin, daunorubicin, beta-blocker withdrawal. |
| **Illicit drugs** | Amphetamines, cocaine, lysergic acid diethylamide (LSD), psilocybin, ecstasy, crack, cocaine. |
| **Other** | Caffeine, alcohol. |

# Recommendations for the therapy of sinus tachycardias (1)

| Recommendations | Class | Level |
|---|---|---|
| **Inappropriate sinus tachycardia** | | |
| Evaluation and treatment of reversible causes is recommended. | I | C |
| Ivabradine alone or in combination with a beta-blocker should be considered in symptomatic patients. | IIa | B |
| Beta-blockers should be considered in symptomatic patients | IIa | C |

# Recommendations for the therapy of sinus tachycardias (2)

| Recommendations | Class | Level |
|---|---|---|
| **Sinus nodal re-entrant tachycardia** | | |
| Non-dihydropyridine calcium-channel blockers (verapamil or diltiazem) in the absence of HFrEF, may be considered in symptomatic patients. | IIb | C |
| Catheter ablation should be considered in symptomatic patients who do not respond to drug therapy. | IIa | C |

# Recommendations for the therapy of sinus tachycardias (3)

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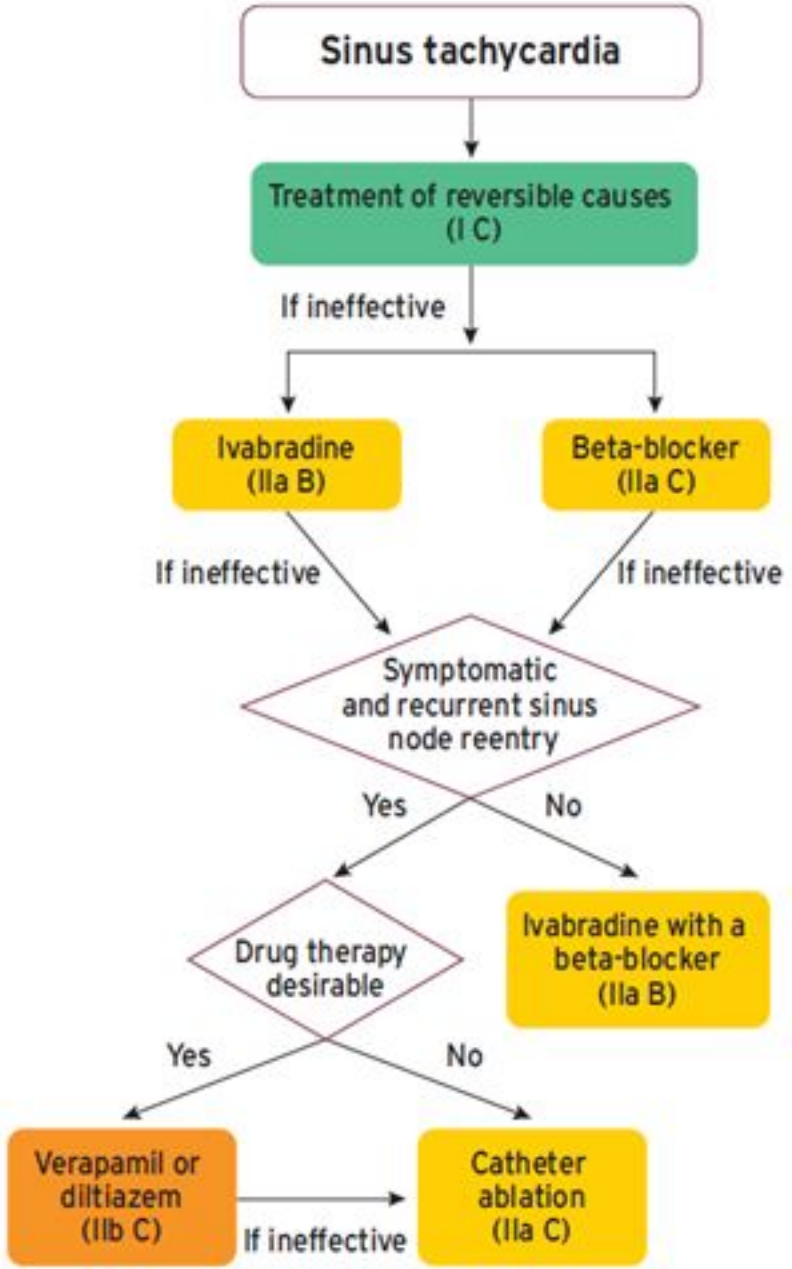
| Recommendations | Class | Level |
|---|---|---|
| **Postural orthostatic tachycardia syndrome** | | |
| A regular and progressive exercise programme should be considered. | IIa | B |
| The consumption of ≥2–3 L of water and 10–12 g of NaCl daily may be considered. | IIb | C |
| Midodrine or low-dose non-selective beta blocker or pyridostigmine may be considered. | IIb | B |
| Ivabradine may be considered. | IIb | C |

# Therapy of sinus tachycardias

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# Recommendations for the therapy of focal atrial tachycardia (1)

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| Recommendations | Class | Level |
|---|---|---|
| *Acute therapy* | | |
| **Haemodynamically unstable patients** | | |
| Synchronized direct-current cardioversion is recommended for haemodynamically unstable patients. | I | B |
| **Haemodynamically stable patients** | | |
| Adenosine (6–18 mg i.v. bolus) should be considered. | IIa | B |
| i.v. beta-blockers (esmolol or metoprolol) should be considered if adenosine fails. | IIa | C |
| i.v. verapamil or diltiazem should be considered if adenosine fails. | IIa | C |

# Recommendations for the therapy of focal atrial tachycardia (2)

| Recommendations | Class | Level |
|---|---|---|
| *Acute therapy* | | |
| **Haemodynamically stable patients** | | |
| If the above measures fail, the following may be used:<br>i.v. ibutilide<br>or i.v. flecainide or propafenone<br>or i.v. amiodarone. | IIb | C |
| Synchronized direct-current cardioversion is recommended when drug therapy fails to convert or control the tachycardia. | I | B |

# Recommendations for the therapy of focal atrial tachycardia (3)

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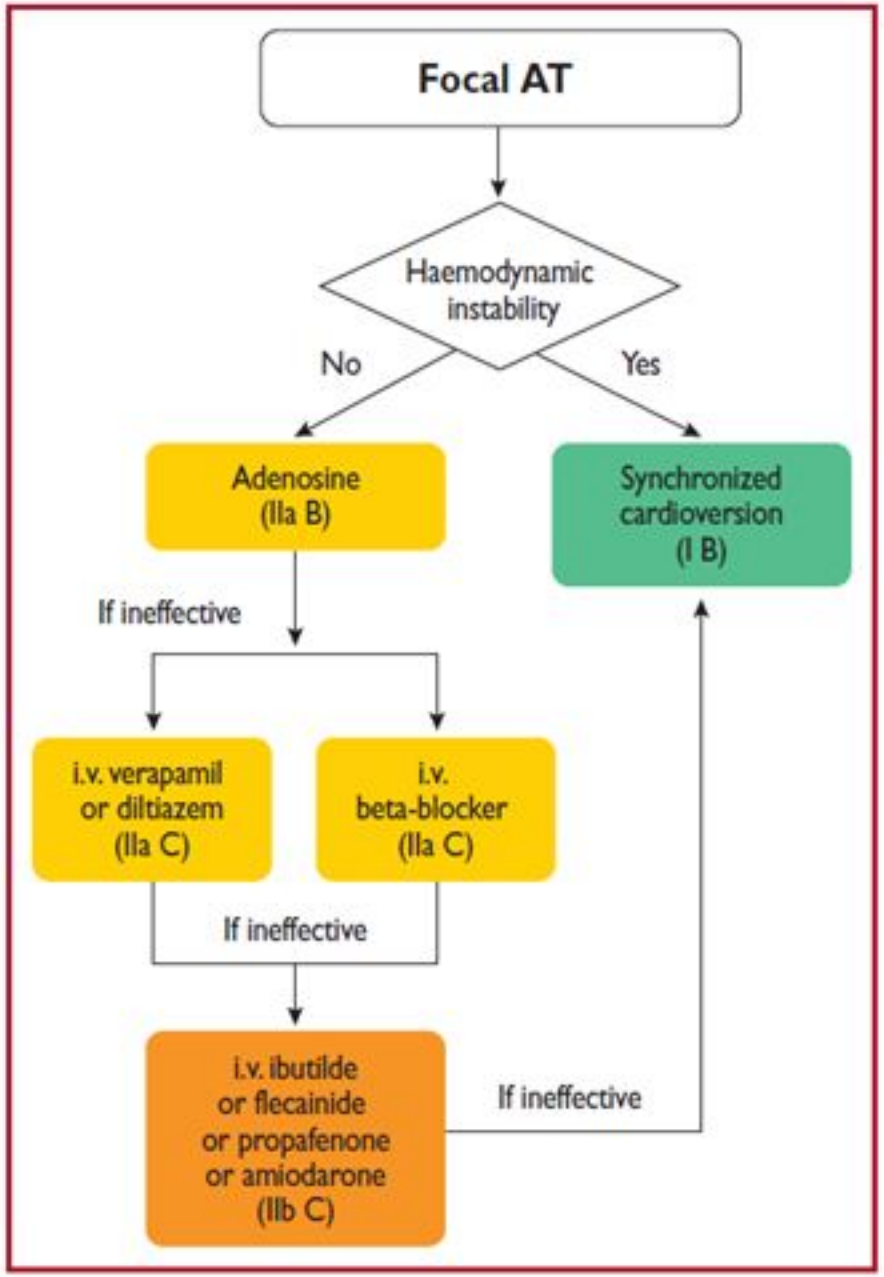
| Recommendations | Class | Level |
|---|---|---|
| ***Chronic therapy*** | | |
| Catheter ablation is recommended for recurrent focal atrial tachycardia, especially if incessant or causing tachycardiomyopathy. | I | B |
| Beta-blockers or non-dihydropyridine calcium-channel blockers (verapamil or diltiazem) in the absence of HFrEF, or propafenone or flecainide in the absence of structural or ischaemic heart disease, should be considered if ablation is not desirable or feasible. | IIa | C |

# Recommendations for the therapy of focal atrial tachycardia (4)

| Recommendations | Class | Level |
|---|---|---|
| ***Chronic therapy*** | | |
| Ivabradine with a beta blocker may be considered if the above measures fail. | IIb | C |
| Amiodarone may be considered if the above measures fail. | IIb | C |




# Acute therapy of focal atrial tachycardia





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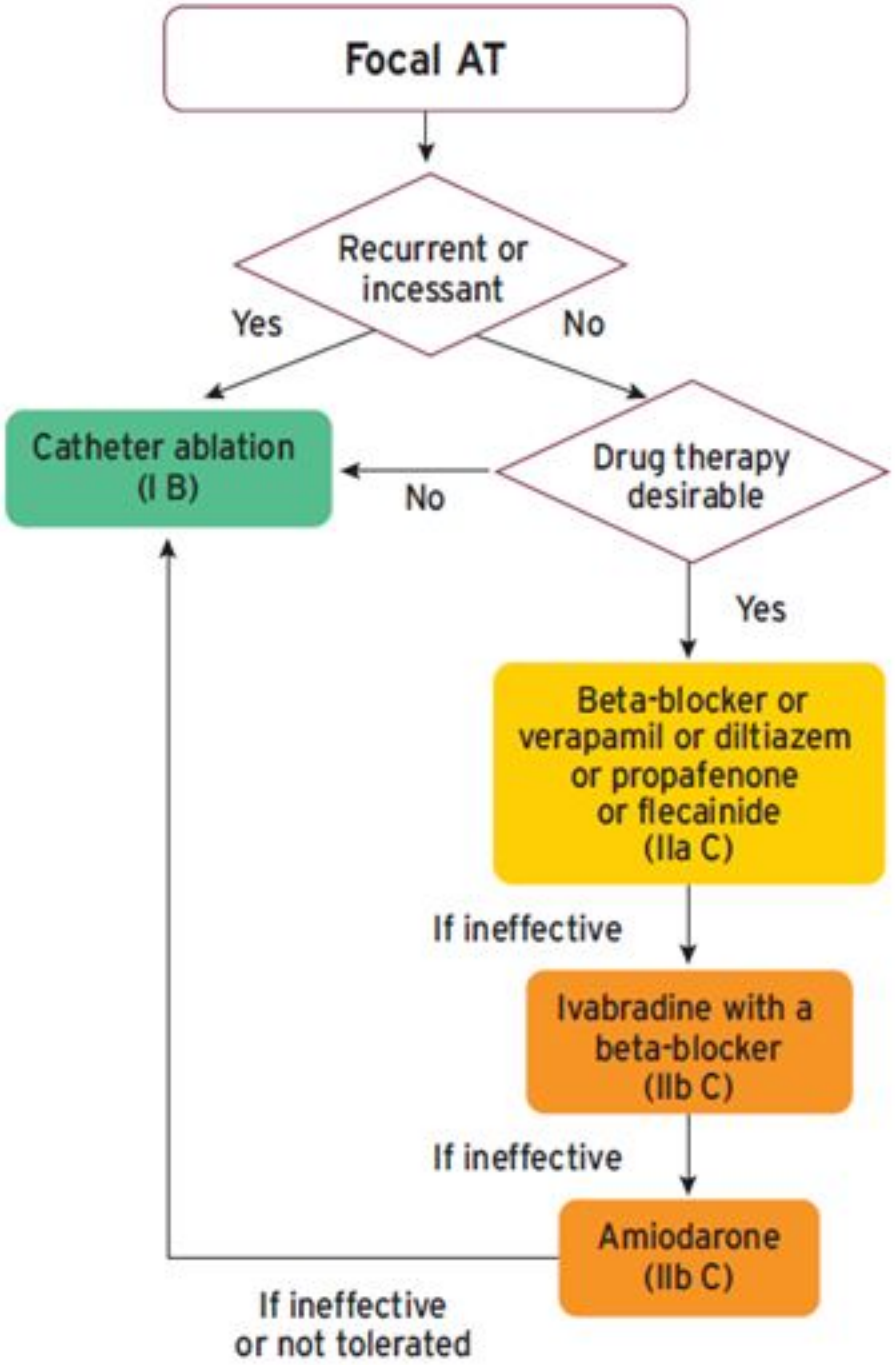
# Chronic therapy of focal atrial tachycardia

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# Recommendations for the therapy of multifocal atrial tachycardia (1)

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| Recommendations | Class | Level |
|---|---|---|
| ***Acute therapy*** | | |
| Treatment of an underlying condition is recommended as a first step, if feasible. | I | C |
| i.v. beta-blockers or non-dihydropyridine calcium-channel blockers (verapamil or diltiazem, in the absence of hypotension or HFrEF) should be considered. | IIa | B |

# Recommendations for the therapy of multifocal atrial tachycardia (2)

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| Recommendations | Class | Level |
|---|---|---|
| ***Chronic therapy*** | | |
| Oral verapamil or diltiazem should be considered for patients with recurrent symptomatic multifocal atrial tachycardia in the absence of HFrEF. | IIa | B |
| A selective beta blocker should be considered for patients with recurrent symptomatic multifocal atrial tachycardia. | IIa | B |
| AV nodal ablation followed by pacing (preferable biventricular or His-bundle pacing) should be considered for patients with LV dysfunction due to recurrent multifocal atrial tachycardia refractory to drug therapy. | IIa | C |

# Recommendations for the therapy of macro-re-entrant atrial arrhythmias (1)

| Recommendations | Class | Level |
|---|---|---|
| Anticoagulation as in AF is recommended for patients with atrial flutter and concomitant AF. | I | B |
| Patients with atrial flutter without AF should be considered for anticoagulation but the threshold for initiation is not established. | IIa | C |

# Recommendations for the therapy of macro-re-entrant atrial arrhythmias (2)

| Recommendations | Class | Level |
|---|---|---|
| **Acute therapy** | | |
| **Haemodynamically unstable patients** | | |
| Synchronized direct-current cardioversion is recommended for haemodynamically unstable patients. | I | B |
| **Haemodynamically stable patients** | | |
| i.v. ibutilide or i.v. or oral (in-hospital) dofetilide are recommended for conversion to sinus rhythm. | I | B |
| Low-energy (≤ J biphasic) electrical cardioversion is recommended for conversion to sinus rhythm. | I | B |

# Recommendations for the therapy of macro-re-entrant atrial arrhythmias (3)

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| Recommendations | Class | Level |
|---|---|---|
| ***Acute therapy*** | | |
| High-rate atrial pacing is recommended for termination of atrial flutter in the presence of an implanted pacemaker or defibrillator. | I | B |
| i.v. beta-blockers or non-dihydropyridine calcium-channel blockers (verapamil or diltiazem, in the absence of hypotension or HFrEF), should be considered for control of rapid ventricular rate. | IIa | B |
| Invasive and non-invasive high-rate atrial pacing may be considered for termination of atrial flutter. | IIb | B |

# Recommendations for the therapy of macro-re-entrant atrial arrhythmias (4)

| Recommendations | Class | Level |
|---|---|---|
| ***Acute therapy*** | | |
| i.v. amiodarone may be tried if the above are not available or desirable. | IIb | C |
| Propafenone and flecainide are not recommended for conversion to sinus rhythm. | III | B |

# Recommendations for the therapy of macro-re-entrant atrial arrhythmias (5)

| Recommendations | Class | Level |
|---|---|---|
| ***Chronic therapy*** | | |
| Catheter ablation should be considered after the first episode of symptomatic typical atrial flutter. | IIa | B |
| Catheter ablation is recommended for symptomatic, recurrent episodes of cavotricuspid isthmus -dependent flutter. | I | A |
| Catheter ablation in experienced centres is recommended for symptomatic, recurrent episodes of non- cavotricuspid isthmus - dependent flutter. | I | B |

# Recommendations for the therapy of macro-re-entrant atrial arrhythmias (6)

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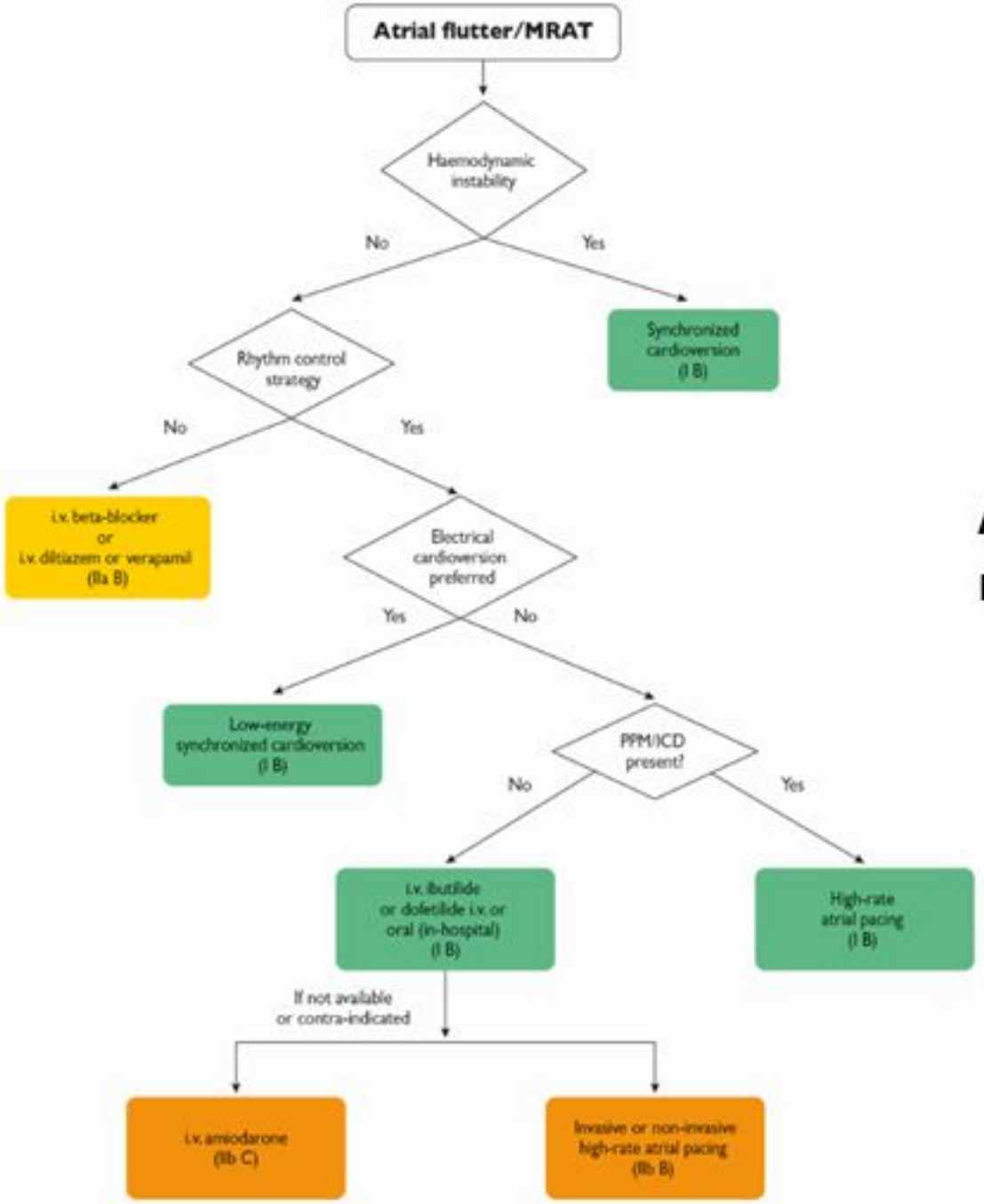
| Recommendations | Class | Level |
|---|---|---|
| ***Chronic therapy*** | | |
| Catheter ablation is recommended in patients with persistent atrial flutter or in the presence of depressed LV systolic function due to tachycardiomyopathy. | I | B |
| Beta-blockers or non-dihydropyridine calcium-channel blockers (verapamil or diltiazem, in the absence HFrEF), should be considered if ablation is not desirable or feasible. | IIa | C |
| Amiodarone may be considered to maintain sinus rhythm if the above measures fail. | IIb | C |

# Recommendations for the therapy of macro-re-entrant atrial arrhythmias (7)

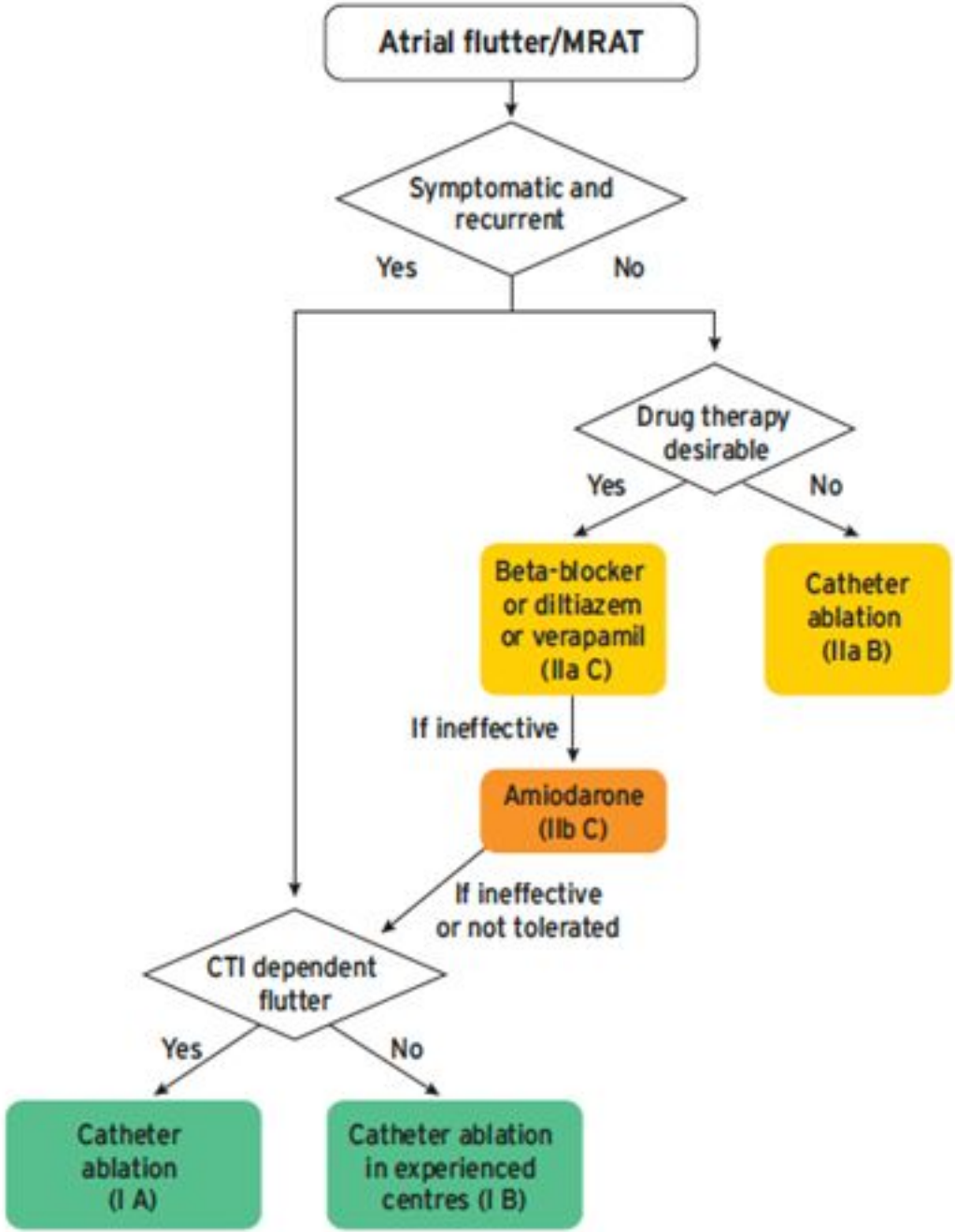
| Recommendations | Class | Level |
|---|---|---|
| ***Chronic therapy*** | | |
| AV nodal ablation with subsequent pacing ("ablate and pace") either biventricular or His-bundle pacing, should be considered if all the above fail, and the patient has symptomatic persistent macro re-entrant atrial arrhythmias with fast ventricular rates. | IIa | C |




# Acute therapy of stable atrial flutter/macro-re-entrant atrial tachycardia



ESC Guidelines for the management of patients with supraventricular Tachycardia (European Heart Journal; 2019)




# Chronic therapy of atrial flutter/macro-re-entrant atrial tachycardia



ESC Guidelines for the management of patients with supraventricular Tachycardia (European Heart Journal; 2019)

# Classification of AVNRT types

| | HA | VA (His) | AH/HA |
|---|---|---|---|
| Typical AVNRT | ≤70 ms | ≤60 ms | >1 |
| Atypical AVNRT | >70 ms | >60 ms | Variable |

# Recommendations for the management of atrioventricular nodal re-entrant tachycardia (AVNRT) (1)

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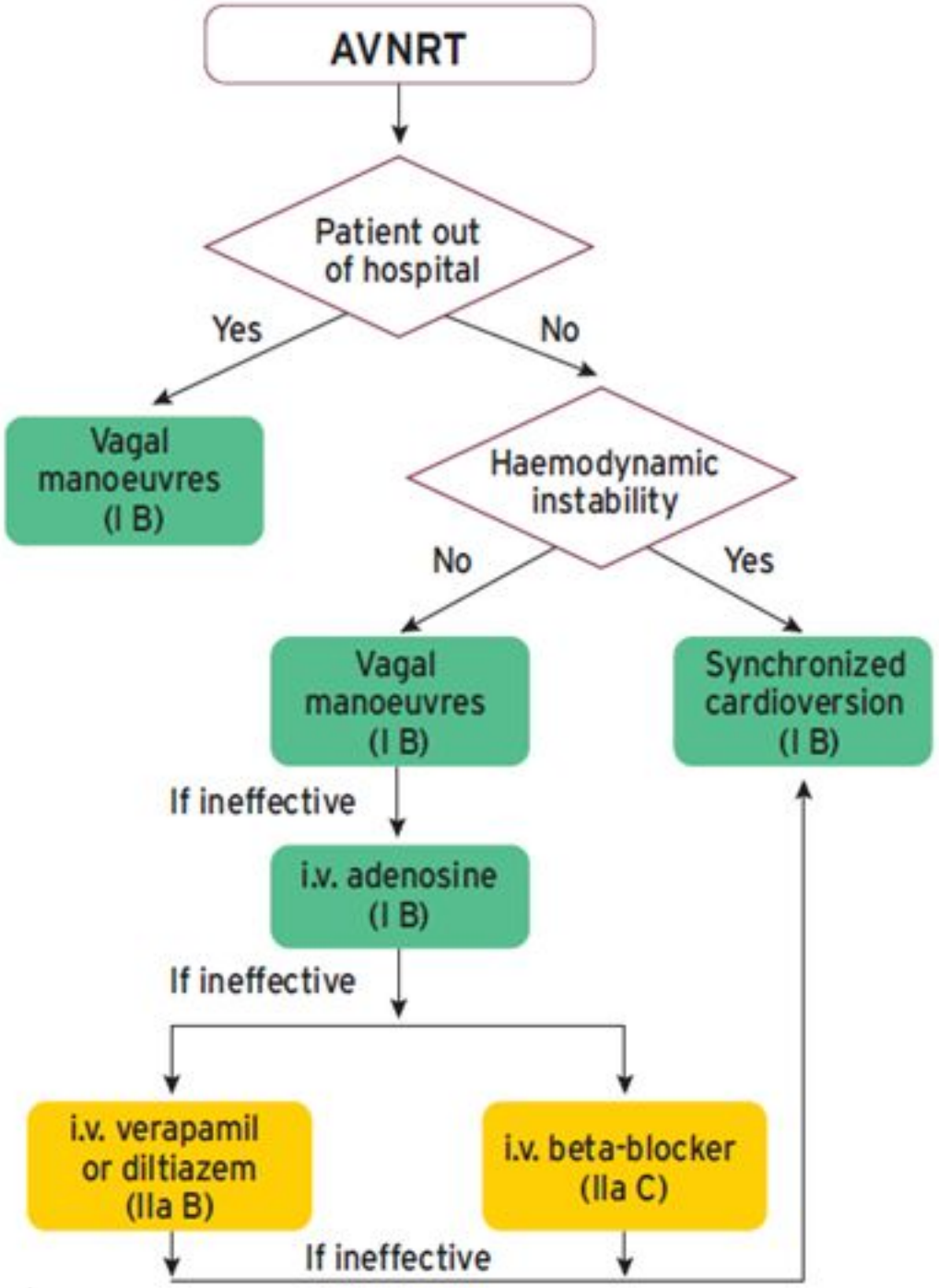
| Recommendations | Class | Level |
|---|---|---|
| *Acute therapy* | | |
| **Haemodynamically unstable patients** | | |
| Synchronized direct-current cardioversion is recommended for haemodynamically unstable patients. | I | B |
| **Haemodynamically stable patients** | | |
| Vagal manoeuvres, preferably in the supine position with leg elevation, are recommended. | I | B |
| Adenosine (6–18 mg i.v. bolus) is recommended if vagal manoeuvres fail. | I | B |

# Recommendations for the management of atrioventricular nodal re-entrant tachycardia (AVNRT) (2)

| Recommendations | Class | Level |
|---|---|---|
| *Acute therapy* | | |
| **Haemodynamically stable patients** | | |
| i.v. verapamil or diltiazem should be considered if vagal manoeuvres and adenosine fail. | IIa | B |
| i.v. beta-blockers (esmolol or metoprolol) should be considered if vagal manoeuvres and adenosine fail. | IIa | C |
| Synchronized direct-current cardioversion is recommended when drug therapy fails to convert or control the tachycardia. | I | B |

# Recommendations for the management of atrioventricular nodal re-entrant tachycardia (AVNRT) (4)

| Recommendations | Class | Level |
|---|---|---|
| ***Chronic therapy*** | | |
| Catheter ablation is recommended for symptomatic, recurrent AVNRT. | I | B |
| Diltiazem or verapamil, in patients without HFrEF, or beta blockers should be considered if ablation is not desirable or feasible. | IIa | B |
| It should be considered to abstain from therapy in minimally symptomatic patients with very infrequent, short-lived episodes of tachycardia. | IIa | C |




# Acute therapy of AVNRT



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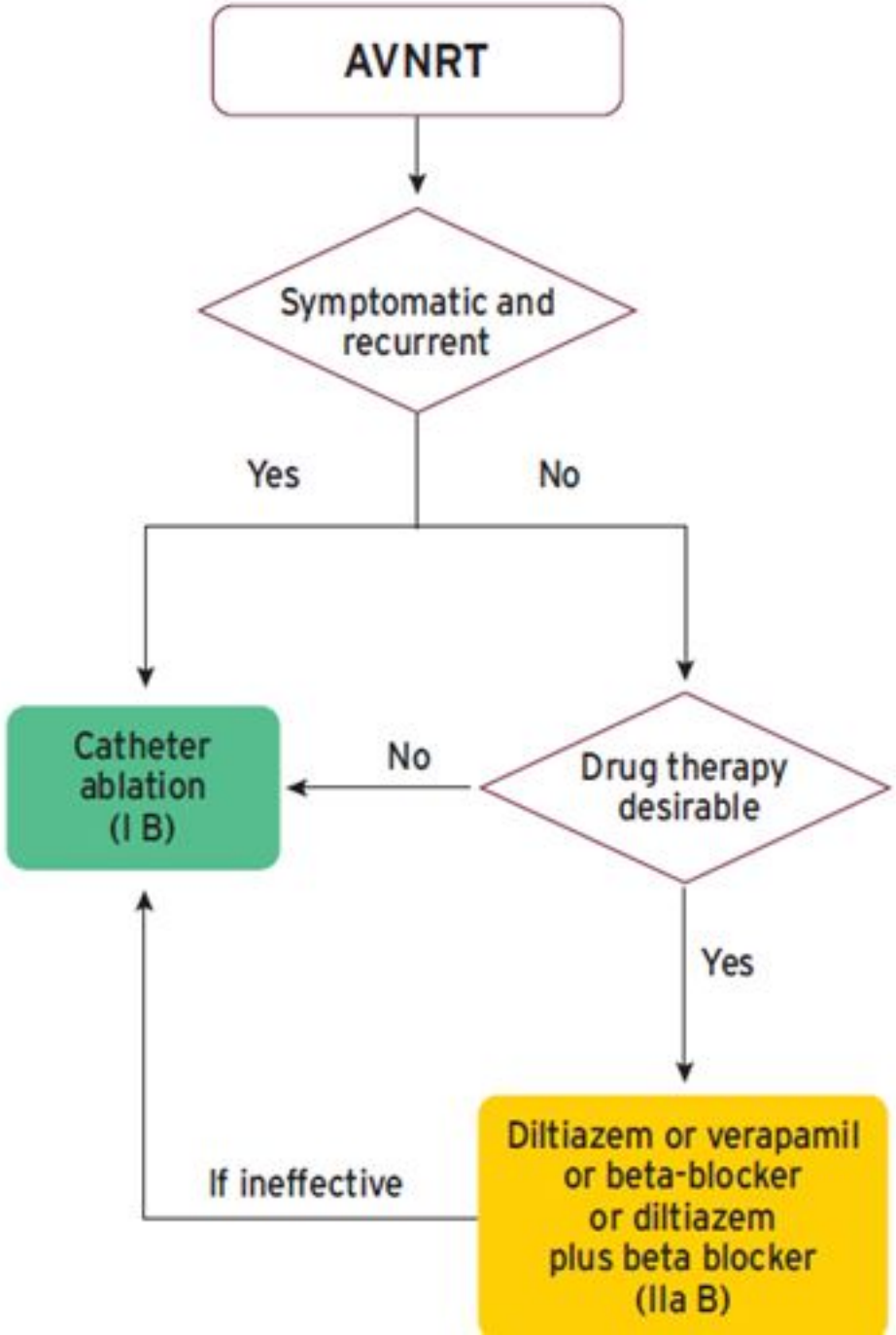


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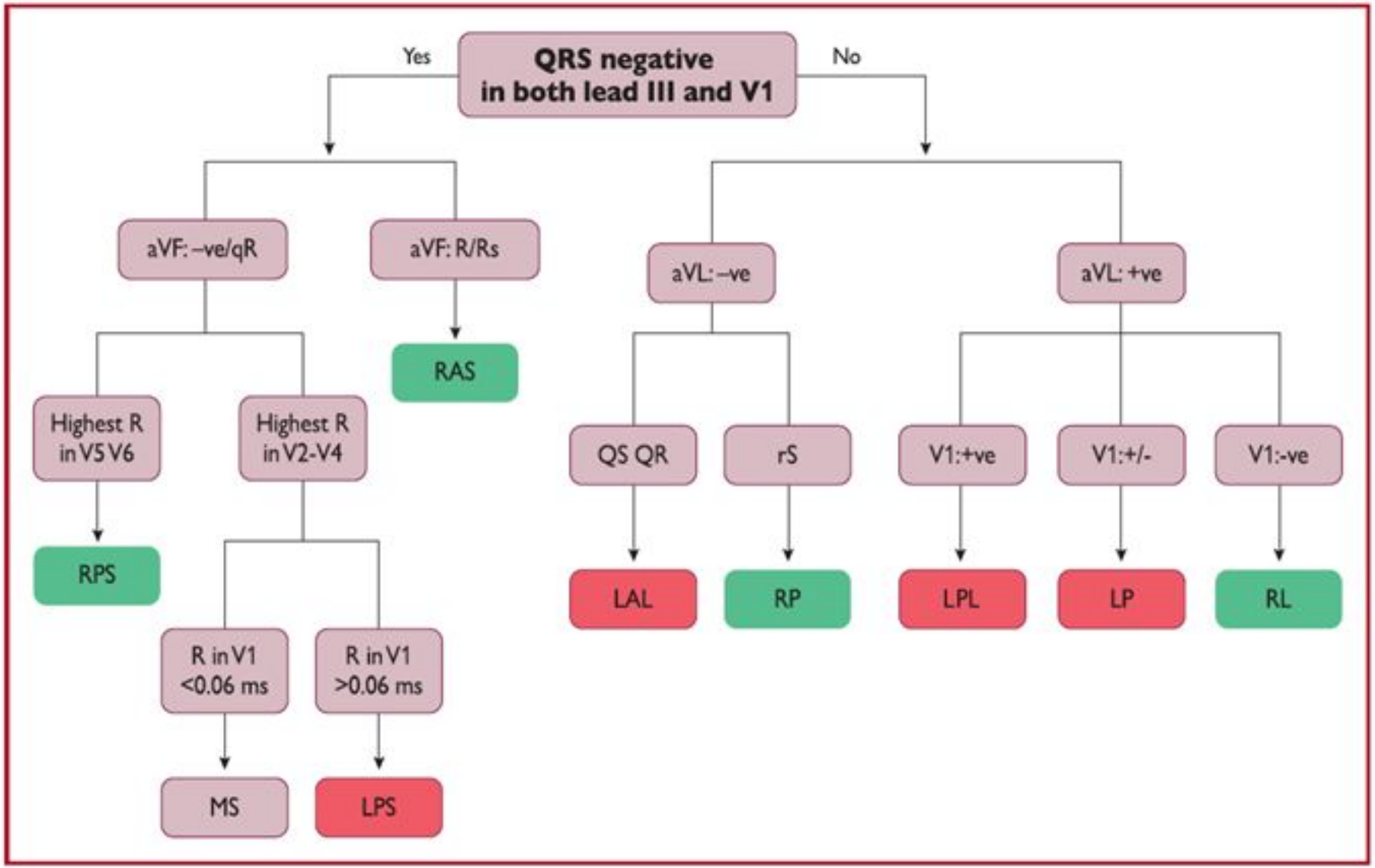
# Chronic therapy of AVNRT



ESC Guidelines for the management of patients with supraventricular Tachycardia (European Heart Journal; 2019)

# St George's algorithm for localization of accessory pathways

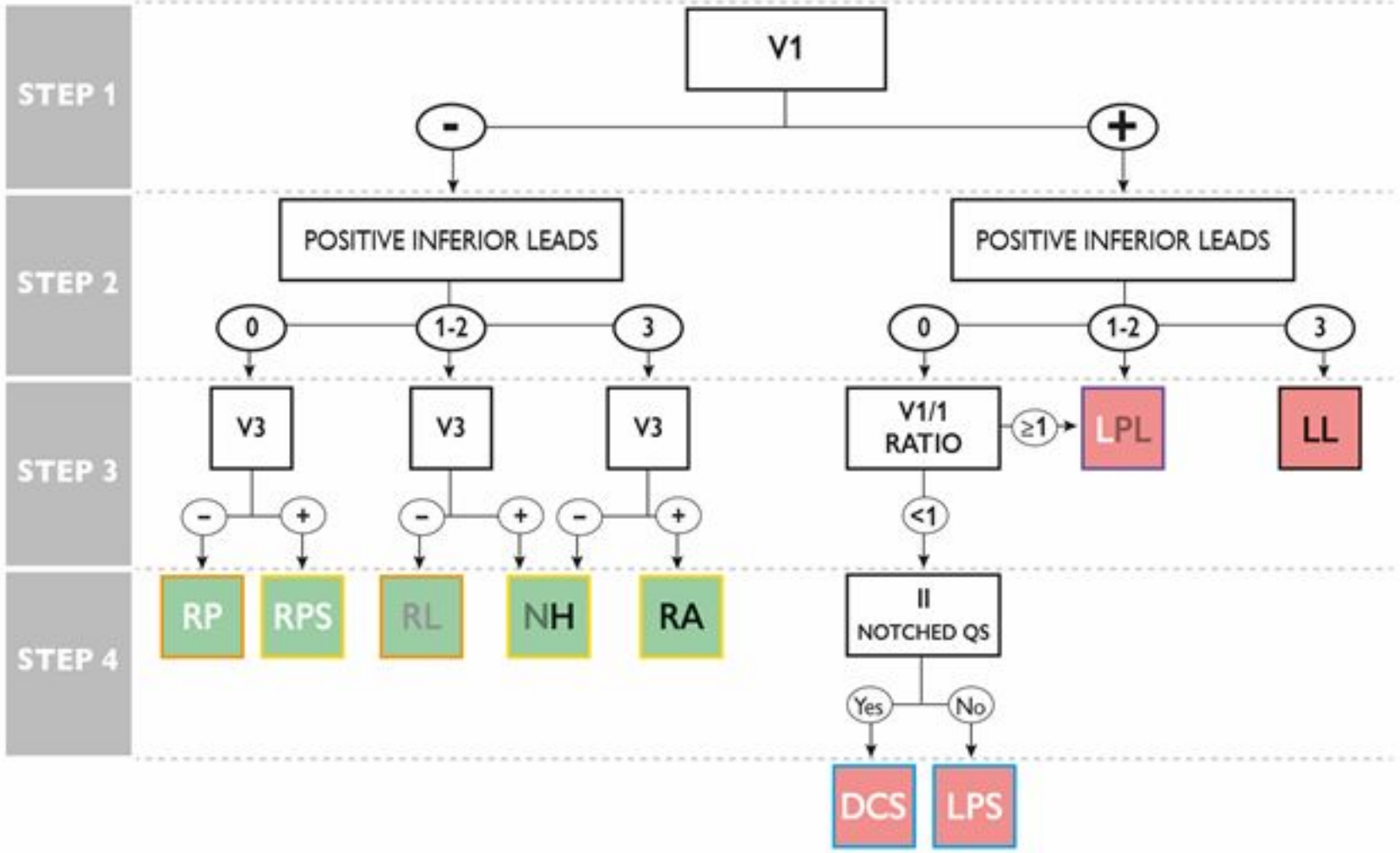







ESC Guidelines for the management of patients with supraventricular Tachycardia (European Heart Journal; 2019)

# Localization of accessory pathways in the presence of maximum (spontaneous or evoked) pre-excitation





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# Recommendations for the therapy of atrioventricular nodal re-entrant tachycardia (AVRT) due to manifest or concealed accessory pathways (1)

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| Recommendations | Class | Level |
|---|---|---|
| *Acute therapy* | | |
| **Haemodynamically unstable patients** | | |
| Synchronized direct-current cardioversion is recommended for haemodynamically unstable patients. | I | B |

# Recommendations for the therapy of atrioventricular nodal re-entrant tachycardia (AVRT) due to manifest or concealed accessory pathways (2)

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| Recommendations | Class | Level |
|---|---|---|
| **Haemodynamically stable patients** | | |
| Vagal manoeuvres, preferably in the supine position with leg elevation, are recommended. | I | B |
| In orthodromic AVRT, adenosine (6–18 mg i.v. bolus) is recommended if vagal manoeuvres fail. | I | B |
| In orthodromic AVRT, i.v. verapamil or diltiazem should be considered if vagal manoeuvres and adenosine fail. | IIa | B |

# Recommendations for the therapy of atrioventricular nodal re-entrant tachycardia (AVRT) due to manifest or concealed accessory pathways (3)

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| Recommendations | Class | Level |
|---|---|---|
| In orthodromic AVRT, i.v. beta-blockers (esmolol or metoprolol) should be considered, if vagal manoeuvres and adenosine fail. | IIa | C |
| In antidromic AVRT, i.v. ibutilide, or i.v. procainamide, or flecainide or propafenone, or synchronized direct-current cardioversion should be considered if vagal manoeuvres and adenosine fail. | IIa | B |
| In antidromic AVRT, i.v. amiodarone may be considered in refractory cases. | IIb | B |
| Synchronized direct-current cardioversion is recommended when drug therapy fails to convert or control the tachycardia. | I | B |

# Recommendations for the therapy of atrioventricular nodal re-entrant tachycardia (AVRT) due to manifest or concealed accessory pathways (4)

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| Recommendations | Class | Level |
|---|---|---|
| *Chronic therapy* | | |
| Catheter ablation of accessory pathway(s) is recommended in patients with symptomatic, recurrent AVRT. | I | B |
| Beta-blockers or non-dihydropyridine calcium-channel blockers (verapamil or diltiazem) in the absence of HFrEF, should be considered if no signs of pre-excitation are present on resting ECG, if ablation is not desirable or feasible. | IIa | B |

# Recommendations for the therapy of atrioventricular nodal re-entrant tachycardia (AVRT) due to manifest or concealed accessory pathways (5)

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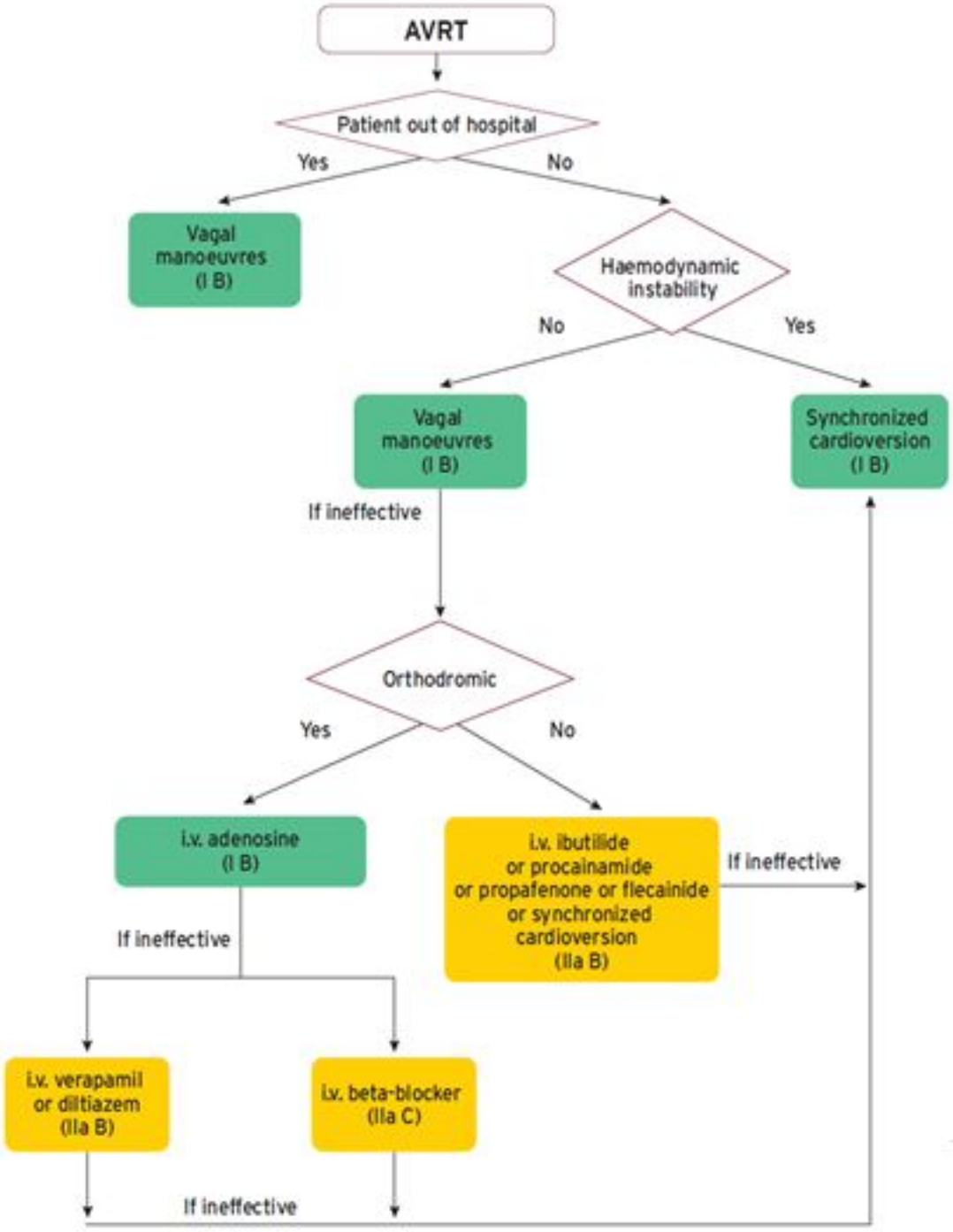
| Recommendations | Class | Level |
|---|---|---|
| *Chronic therapy* | | |
| Propafenone or flecainide may be considered in patients with AVRT and without structural heart disease, if ablation is not desirable or feasible. | IIb | B |
| Digoxin, beta-blockers, diltiazem, verapamil and amiodarone are not recommended and are potentially harmful in patients with pre-excited AF. | III | B |

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# Acute therapy of AVRT



ESC Guidelines for the management of patients with supraventricular Tachycardia (European Heart Journal; 2019)

# Recommendations for the acute therapy of pre-excited atrial fibrillation

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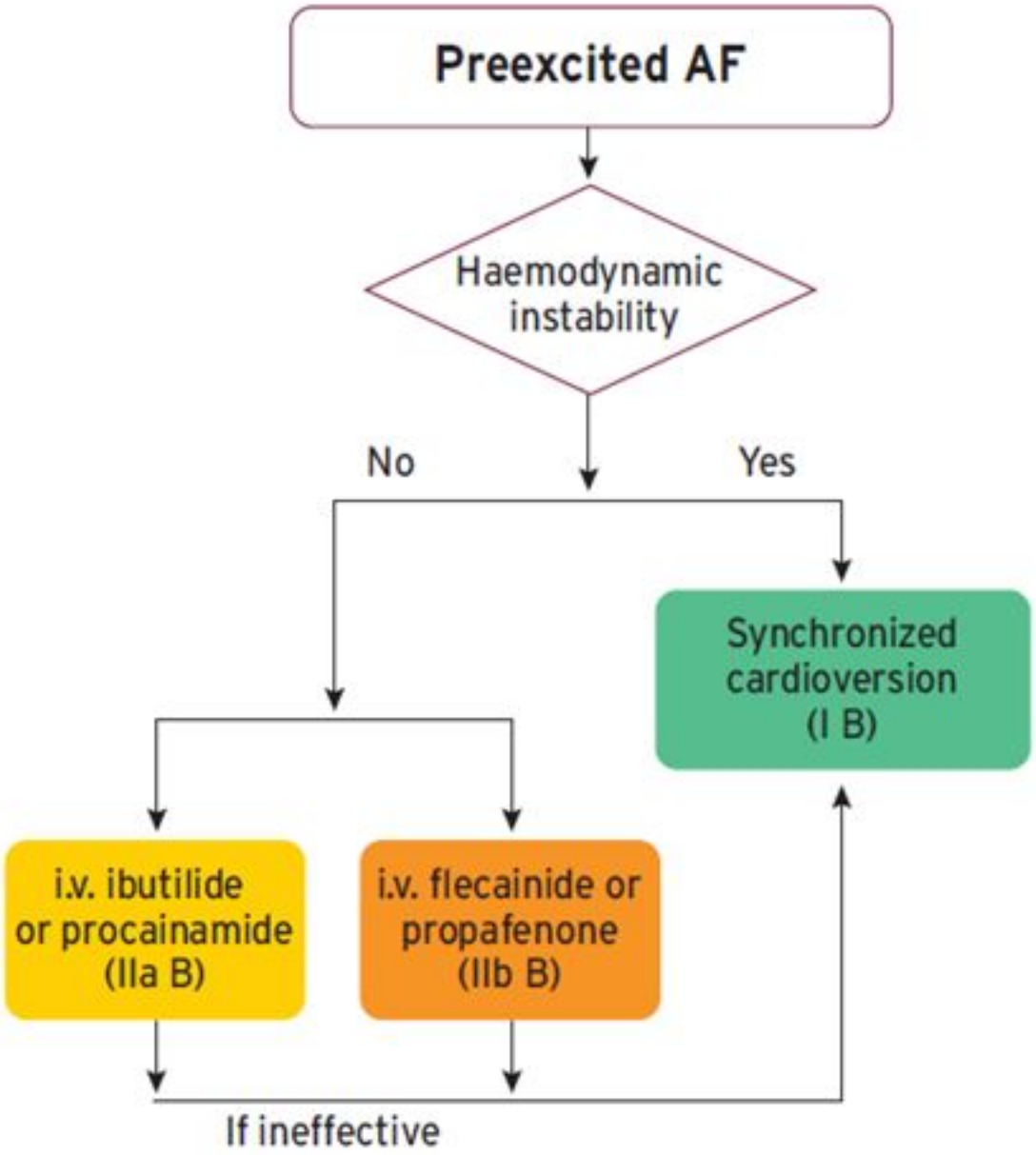
| Recommendations | Class | Level |
|---|---|---|
| **Haemodynamically unstable patients** | | |
| Synchronized direct-current cardioversion is recommended in haemodynamically unstable patients. | I | B |
| **Haemodynamically stable patients** | | |
| i.v. ibutilide or procainamide should be considered. | IIa | B |
| i.v. flecainide or propafenone may be considered. | IIb | B |
| Synchronized direct-current cardioversion is recommended if drug therapy fails to convert or control the tachycardia. | I | B |
| i.v. amiodarone is not recommended. | III | B |

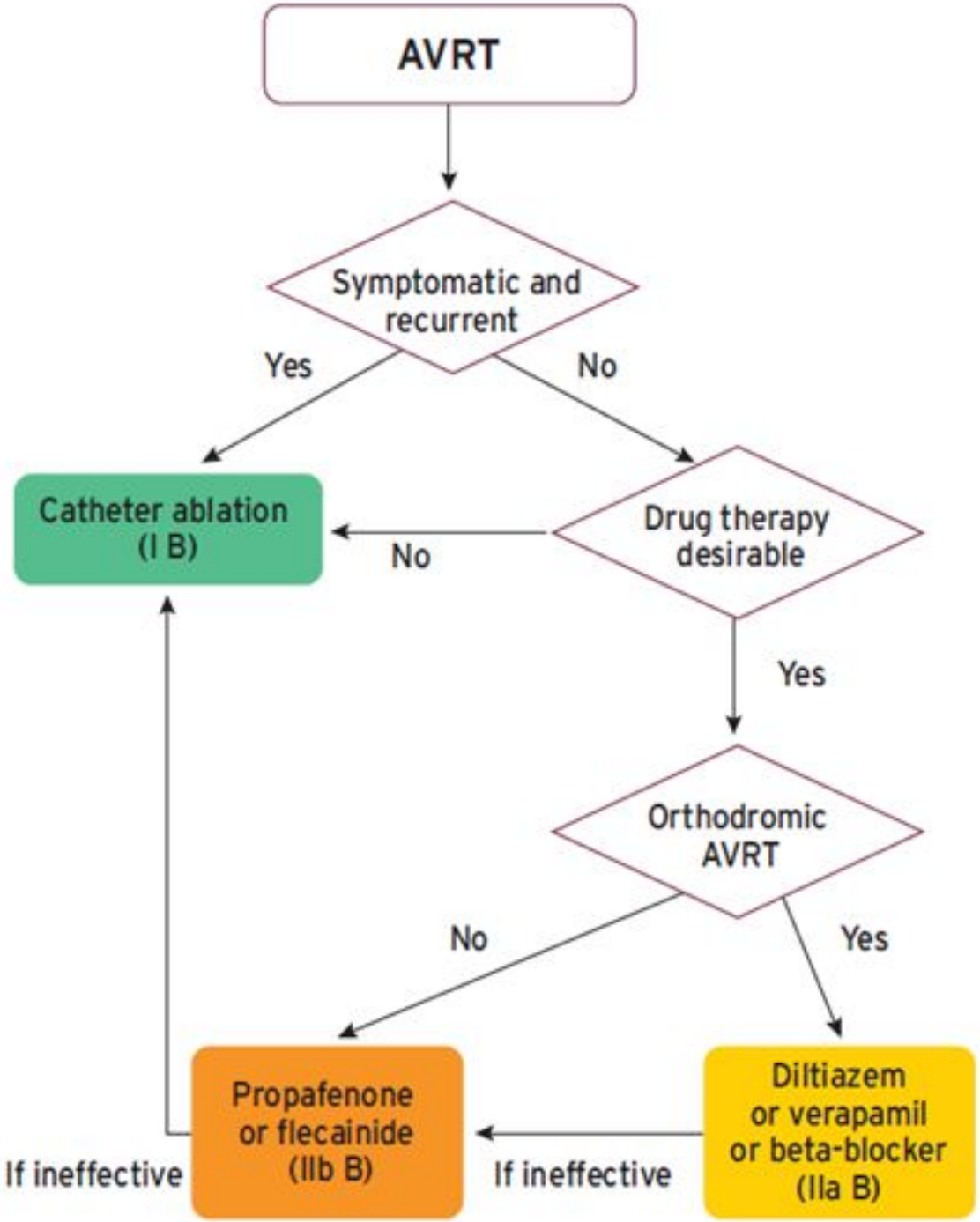




ESC Guidelines for the management of patients with supraventricular Tachycardia
(European Heart Journal; 2019)

# Acute therapy of pre-excited AF






# Chronic therapy of AVRT

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ESC Guidelines for the management of patients with supraventricular Tachycardia (European Heart Journal; 2019)

# Recommendations for the management of patients with asymptomatic pre-excitation (1)

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| Recommendations | Class | Level |
|---|---|---|
| Performance of an EPS, with the use of isoprenaline, is recommended to risk stratify individuals with asymptomatic pre-excitation who have high risk occupations/hobbies, and those who participate in competitive athletics. | I | B |
| Catheter ablation is recommended in asymptomatic patients in whom EP testing with the use of isoprenaline identifies high risk properties, such as SPERRI ≤250 ms, AP ERP ≤250 ms, multiple APs, and an inducible AP-mediated tachycardia. | I | B |

# Recommendations for the management of patients with asymptomatic pre-excitation (2)

| Recommendations | Class | Level |
|---|---|---|
| Catheter ablation is recommended in high-risk patients with asymptomatic pre-excitation after discussing the risks, especially of heart block associated with ablation of anteroseptal or mid-septal APs, and benefits of the procedure. | I | C |
| Performance of an EPS to risk stratify individuals with asymptomatic pre-excitation should be considered. | IIa | B |
| Non-invasive evaluation of the conducting properties of the AP in individuals with asymptomatic pre-excitation may be considered. | IIb | B |

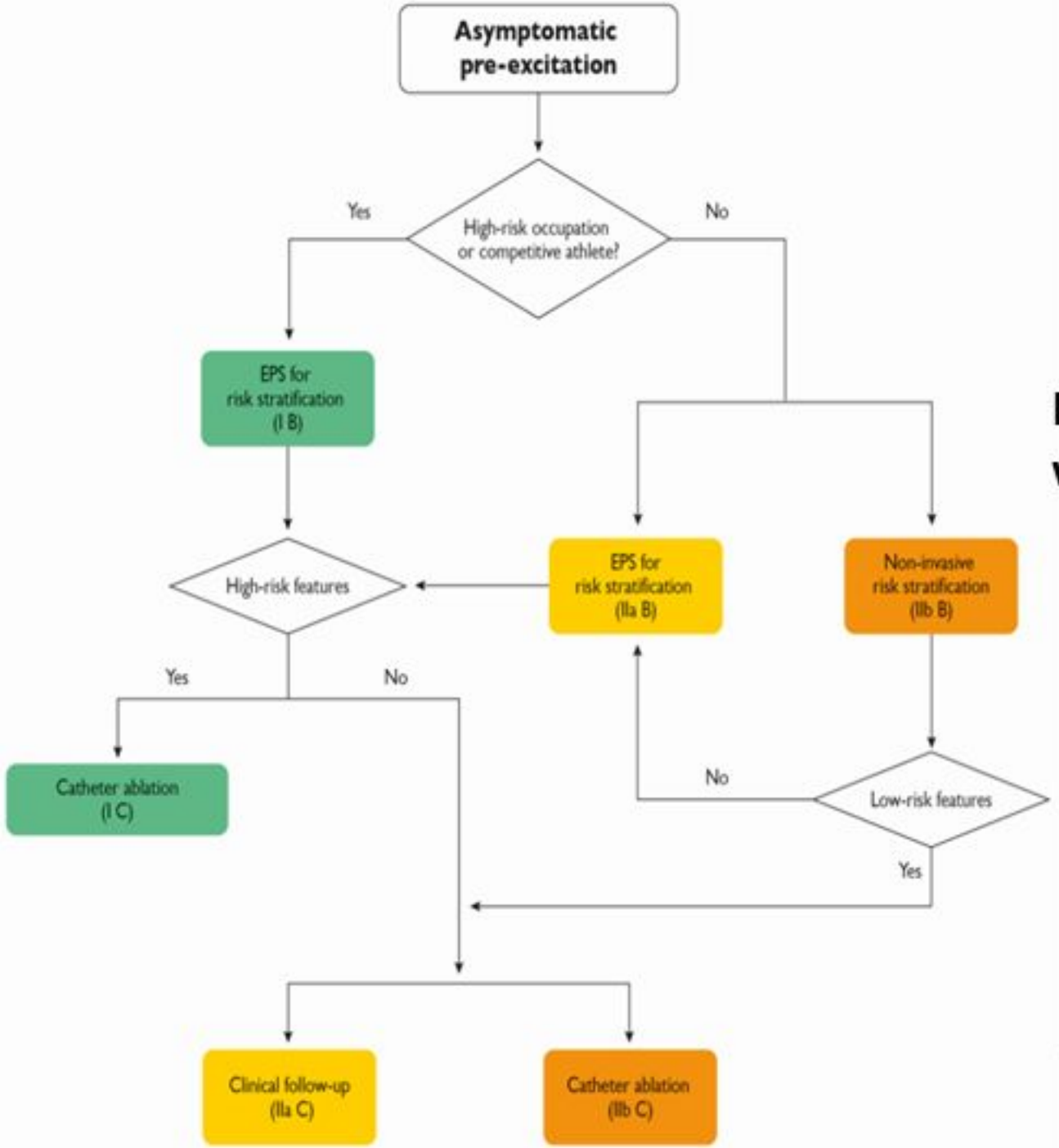
# Recommendations for the management of patients with asymptomatic pre-excitation (3)

ESC European Society of Cardiology

| Recommendations | Class | Level |
|---|---|---|
| Invasive risk stratification with an EPS is recommended in patients without "low risk" characteristics at non-invasive risk stratification. | I | C |
| Clinical follow-up should be considered in a patient with asymptomatic pre-excitation, and low risk AP at invasive risk stratification. | IIa | C |
| Catheter ablation may be considered in a patient with asymptomatic pre-excitation, and low risk AP at invasive or non-invasive risk stratification. | IIb | C |

# Recommendations for the management of patients with asymptomatic pre-excitation (4)

| Recommendations | Class | Level |
|---|---|---|
| Catheter ablation should be considered in patients with asymptomatic pre-excitation and left ventricular dysfunction due to electrical dyssynchrony. | IIa | C |
| Catheter ablation of low-risk asymptomatic pre-excitation in appropriately experienced centres according to patient preferences may be considered. | IIb | C |

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# Risk stratification and therapy of patients with asymptomatic pre-excitation



Guidelines for the management of patients with supraventricular Tachycardia
(European Heart Journal; 2019)

# Recommendations for the therapy of supraventricular tachycardias in congenital heart disease in adults (1)

| Recommendations | Class | Level |
|---|---|---|
| Anticoagulation for focal AT or atrial flutter should be similar to patients with AF. | I | C |
| ***Acute therapy*** | | |
| **Haemodynamically unstable patients** | | |
| Synchronized direct-current cardioversion is recommended for haemodynamically unstable patients. | I | B |

# Recommendations for the therapy of supraventricular tachycardias in congenital heart disease in adults (2)

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| Recommendations | Class | Level |
|---|---|---|
| **Haemodynamically stable patients** | | |
| Vagal manoeuvres, preferably in the supine position with leg elevation, are recommended. | I | B |
| Adenosine (6–18 mg i.v. bolus) is recommended if vagal manoeuvres fail. | I | B |
| i.v. verapamil or diltiazem should be considered if vagal manoeuvres and adenosine fail. | IIa | B |

# Recommendations for the therapy of supraventricular tachycardias in congenital heart disease in adults (3)

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| Recommendations | Class | Level |
|---|---|---|
| **Haemodynamically stable patients** | | |
| i.v. beta-blockers (esmolol or metoprolol) should be considered, if vagal manoeuvres and adenosine fail. | IIa | C |
| Synchronized direct-current cardioversion is recommended when drug therapy fails to convert or control the tachycardia. | I | B |





ESC Guidelines for the management of patients with supraventricular Tachycardia (European Heart Journal; 2019)

# Recommendations for the therapy of supraventricular tachycardias in congenital heart disease in adults (4)

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| Recommendations | Class | Level |
|---|---|---|
| *Chronic therapy* | | |
| Catheter ablation in experienced centres should be considered. | IIa | C |
| Beta-blockers should be considered for recurrent focal AT or atrial flutter if ablation is not possible or successful. | IIa | C |
| In patients with SVT planned for surgical repair of a congenital heart disease anomaly, preoperative catheter ablation or intraoperative surgical ablation should be considered. | IIa | C |

# Recommendations for the therapy of supraventricular tachycardias in congenital heart disease in adults (5)

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| Recommendations | Class | Level |
|---|---|---|
| *Chronic therapy* | | |
| Amiodarone may be considered for prevention if ablation is not possible or successful. | IIb | C |
| Sotalol is not recommended as a first line antiarrhythmic drug as it is related to increased risk of proarrhythmias and mortality. | III | C |
| Flecainide and propafenone are not recommended as first line antiarrhythmic drugs in patients with ventricular dysfunction and severe fibrosis. | III | C |

# Recommendations for the therapy SVT in pregnancy (1)

| Recommendations | Class | Level |
|---|---|---|
| Catheter ablation is recommended in symptomatic women with recurrent SVT who plan to become pregnant. | I | C |
| ***Acute therapy*** | | |
| Immediate electrical cardioversion is recommended for any tachycardia with haemodynamic instability. | I | C |
| Vagal manoeuvres and, if these fail, adenosine are recommended for acute conversion of SVT. | I | C |

# Recommendations for the therapy SVT in pregnancy (2)

ESC European Society of Cardiology

| Recommendations | Class | Level |
|---|---|---|
| ***Acute therapy*** | | |
| An i.v. beta-1 selective blocker (except atenolol) should be considered for acute conversion or rate control of SVT. | IIa | C |
| i.v. digoxin should be considered for rate control of AT if beta-blockers fail. | IIa | C |
| i.v. ibutilide may be considered for termination of atrial flutter. | IIb | C |

# Recommendations for the therapy SVT in pregnancy (3)

| Recommendations | Class | Level |
|---|---|---|
| *Chronic therapy* | | |
| During the first trimester of pregnancy it is recommended to avoid all antiarrhythmic drugs, if possible. | I | C |
| Beta-1 selective (except atenolol) beta blockers or verapamil, in order of preference, should be considered for prevention of SVT in patients without WPW syndrome. | IIa | C |
| Flecainide or propafenone should be considered for prevention of SVT in patients with WPW syndrome and without structural heart disease. | IIa | C |

# Recommendations for the therapy SVT in pregnancy (4)

| Recommendations | Class | Level |
|---|---|---|
| *Chronic therapy* | | |
| Flecainide or propafenone in patients without ischaemic or structural heart disease should be considered if AV-nodal blocking agents fail to prevent SVT | IIa | C |
| Digoxin or verapamil should be considered for rate control of AT if beta-blockers fail, in patients without WPW syndrome. | IIa | C |
| Amiodarone is not recommended in pregnant women. | III | C |
| Fluoroless catheter ablation should be considered in case of drug-refractory or poorly tolerated SVT, in experienced centres. | IIa | C |





ESC Guidelines for the management of patients with supraventricular Tachycardia (European Heart Journal; 2019)

# Recommendations for the therapy of SVT in patients with suspected or established heart failure due to tachycardiomyopathy (1)

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| Recommendations | Class | Level |
|---|---|---|
| Catheter ablation is recommended for tachycardiomyopathy due to SVT. | I | B |
| Beta-blockers (from the list with proven mortality and morbidity benefits in HFrEF) are recommended for tachycardiomyopatrhy due to SVT, when catheter ablation fails or is not applicable. | I | A |
| It is recommended to consider tachycardiomyopathy in patient with reduced LVEF with an elevated heart rate (>100 bpm). | I | B |





ESC Guidelines for the management of patients with supraventricular Tachycardia
(European Heart Journal; 2019)

# Recommendations for the therapy of SVT in patients with suspected or established heart failure due to tachycardiomyopathy (2)

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| Recommendations | Class | Level |
|---|---|---|
| 24 h (or multi-day) ambulatory ECG monitoring should be considered for diagnosis of tachycardiomyopathy by identifying subclinical or intermittent arrhythmias. | IIa | B |
| AV nodal ablation with subsequent pacing ("ablate and pace") either biventricular or His-bundle pacing, is recommended if the tachycardia responsible for the tachycardiomyopathy cannot be ablated or controlled by drugs. | I | C |

# Recommendations for sports participation in athletes with supraventricular arrhythmias (1)

| | Criteria for eligibility | Eligibility |
|---|---|---|
| Premature atrial beats | No symptoms, no cardiac disease | All sports |
| AVRT or atrial fibrillation in the context of WPW syndrome | Ablation is mandatory. Sports are allowed one month after ablation if there are no recurrences | All sports |





ESC Guidelines for the management of patients with supraventricular Tachycardia
(European Heart Journal; 2019)

# Recommendations for sports participation in athletes with supraventricular arrhythmias (2)

| | Criteria for eligibility | Eligibility |
|---|---|---|
| Asymptomatic ventricular preexcitation | In patients at high-risk ablation is mandatory. Sports are allowed one month after ablation if there are no recurrences. | All sports |

# Recommendations for sports participation in athletes with supraventricular arrhythmias (3)

| | Criteria for eligibility | Eligibility |
|---|---|---|
| Paroxysmal supraventricular tachycardia (AVNRT, AVRT over a concealed accessory pathway and atrial tachycardia) | Ablation is recommended. Sports are allowed one month after ablation if there are no recurrences. | All sports |
| | Ablation undesirable or not feasible. | All sports, except those with high intrinsic risk of loss of consciousness. |

# Recommendations on driving restriction in patients with SVT (1)

| Conduction Disorder/ Arrhythmia | Group 1 | Group 2 |
|---|---|---|
| Atrial fibrillation/atrial flutter/focal atrial tachycardia | Driving may continue provided no history of syncope. If history of syncope, driving must cease until the condition has been satisfactorily controlled /treated. | - Driving may continue provided no history of syncope and anticoagulation guidelines are adhered to.<br>-If history of syncope, driving must cease unless the underlying cause is treated, and the risk of recurrence is low. Rate control during tachycardia should be adequate.<br>-Driving can only be resumed after medical assessment. |





ESC Guidelines for the management of patients with supraventricular Tachycardia (European Heart Journal; 2019)

# Recommendations on driving restriction in patients with SVT (2)

| Conduction Disorder/ Arrhythmia | Group 1 | Group 2 |
|---|---|---|
| AVNRT, AVRT, and WPW | If history of syncope, driving must cease until the condition has been satisfactorily controlled /treated. | - Driving may continue provided no history of syncope or other significant symptoms (e.g. palpitations with dizziness).<br>- If so, driving must cease until the underlying cause is treated so that the risk of recurrence is low.<br>- In case of pre-excitation, driving may only be allowed after specialist assessment. |


# SVT

Guidelines for the Management of Patients with Supraventricular Tachycardia

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