

# Review of the 2019 European Society of Cardiology Guidelines for the management of patients with supraventricular tachycardia: What is new, and what has changed?

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## ABSTRACT

Supraventricular arrhythmias are frequent, and symptomatic patients often need medical therapy or catheter ablation. The recently published 2019 European Society of Cardiology (ESC) Guidelines for the management of patients with supraventricular tachycardia (SVT) give a comprehensive overview of current developments in the field and provides recommendations for the management of adults with SVT. In this paper, we briefly summarized major new recommendations and significant changes from the former ESC guideline published 16 years ago. (*Anatol J Cardiol* 2019; 22: 282-6)

**Keywords:** ablation, antiarrhythmics, arrhythmia, guideline, pre-excitation, supraventricular, tachycardia

## Introduction

Sixteen years after the last European Society of Cardiology (ESC) guidelines for the management of supraventricular tachycardia (SVT), the new 2019 ESC Guidelines for the management of patients with SVT were published (1). Since the 2003 ESC Guidelines (2), there has been a substantial development in the invasive treatment of arrhythmias (1, 3, 4). Most randomized controlled clinical trials have examined atrial fibrillation (AF), with only a few trials in paroxysmal SVTs, which are rarer and mostly not life-threatening (1, 5). As a result, compared with many other ESC guidelines, the scientific evidence supporting recommendations in the SVT management guidelines is less clear (4). In the new guidelines, there are some changes and new recommendations regarding management, medical treatment, and catheter ablation of SVTs. Specifically, 75 recommendations had an increase in the level of evidence (LOE); 34 recommendations had a decrease in LOE; and 20 recommendations had class changes (1). Herein, we aimed to briefly review the recent changes and new recommendations in the 2019 ESC Guidelines for the management of patients with SVT.

## Acute management of narrow QRS tachycardias

The initial approach to acute management of narrow QRS tachycardia tends to be non-drug-based vagal maneuvers, with escalation to intravenous (i.v.) drugs or electrical cardioversion in the absence of early correction. Use of verapamil or diltiazem for the acute management of hemodynamically narrow QRS tachycardias had Class I recommendation (LOE: A) in previous guidelines (2). This recommendation was based on a study reported by Waxman et al. (6). In this relatively small study, the effectiveness of verapamil was evaluated in 30 patients with paroxysmal SVT. Recent guidelines reduced the class of recommendation and LOE for the use of verapamil or diltiazem. The document states that verapamil or diltiazem (i.v.) should be considered if vagal maneuvers and adenosine fail (Class IIa, Level of Evidence: B). Verapamil or diltiazem has been shown to terminate narrow QRS tachycardias in most of patients but that they might cause hypotension. Importantly, verapamil or diltiazem should be avoided in patients with hemodynamic instability, heart failure (HF) with reduced ejection fraction (HFrEF), a suspicion of ventricular tachycardia (VT), or pre-excited AF (1, 3).

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Although the evidence about terminating narrow QRS tachycardia with beta-blockers is limited, they have a better safety profile in hemodynamically stable patients (1, 3). Recent guideline upgraded the class of recommendation and LOE for use of beta-blockers in narrow QRS tachycardias. The document states that beta-blockers (i.v. esmolol or metoprolol) should be considered if vagal maneuvers and adenosine fail (Class IIa, LOE: B) (1). However, beta-blockers are contraindicated in decompensated HF. Caution is needed with concomitant use of beta-blockers with i.v. calcium-channel blockers because of the risk of severe hypotension and bradycardia.

Etripamil, an intranasally administered, L-type calcium-channel blocker, is mentioned for the first time in recent ESC guidelines. Etripamil demonstrated high efficacy for rapid SVT termination and conversion to sinus rhythm and was generally well tolerated in NODE-1 [Efficacy and Safety of Intranasal MSP-2017 (Etripamil) for the Conversion of PSVT to Sinus Rhythm] (7). Finally, amiodarone and digoxin are not mentioned in the 2019 Guidelines' subsection on the acute management of narrow QRS tachycardias.

#### Acute management of wide QRS tachycardias

In a hemodynamically stable patient with wide QRS tachycardia, the response to vagal maneuvers may provide insight into the arrhythmia. SVT with aberrancy, if definitively identified, may be treated similarly to narrow complex SVT, with vagal maneuvers or medicines (adenosine, beta-blockers, or calcium-channel blockers) (1, 3). For pharmacological termination of a hemodynamically stable wide QRS tachycardia, procainamide or amiodarone can be used in hospital setting. Procainamide had Class I recommendation (LOE: B) in previous ESC guidelines (2). In the PROCAMIO trial in patients with well-tolerated wide QRS tachycardia, with or without reduced LV ejection fraction, procainamide had a higher proportion of tachycardia termination compared with amiodarone (8). There is change in the class of recommendation regarding the use of procainamide, and the new ESC 2019 Guidelines state that procainamide (i.v.) should be considered if vagal maneuvers and adenosine fail (Class IIa, LOE: B).

Similarly, amiodarone had Class I recommendation (LOE: B) in previous ESC guideline (2). Recent ESC Guidelines reduced the class of recommendation of amiodarone in acute management of wide QRS tachycardias based on the PROCAMIO trial (8). In the new guideline, amiodarone (i.v.) may be considered in the acute management of wide QRS tachycardias if vagal maneuvers and adenosine treatment fail (Class IIb, LOE: B) (1).

Adenosine should be used with caution because it may produce AF with a rapid ventricular rate in pre-excited tachycardias. In addition, adenosine should be used with caution in patients with severe coronary artery disease. Adenosine had Class IIb recommendation in former guidelines (LOE: C) (2). Recent ESC Guidelines upgraded the class of recommendation to IIa, and they state that adenosine should be considered if vagal maneuvers fail and there is no pre-excitation on a resting ECG

(LOE: C) (1). Sotalol and lidocaine are not mentioned in the 2019 Guidelines' subsection on the acute management of wide QRS tachycardias.

#### Therapy of inappropriate sinus tachycardia

Inappropriate sinus tachycardia (IST) is a fast sinus rhythm (>100 bpm) at rest or minimal activity that is out of proportion with the level of physical, emotional, pathological, or pharmacologic stress (3, 4, 9). As a new recommendation, recent ESC Guidelines note that ivabradine alone or in combination with a beta-blocker should be considered in symptomatic patients with IST (Class IIa, LOE: B) (1). Beta-blockers had Class I recommendation (LOE: C) in previous ESC guidelines in patients with IST (2). However, beta-blockers may be needed at doses high enough to cause intolerable side effects, such as chronic fatigue. Recent ESC Guidelines revised the class of recommendation and suggest that beta-blockers should be considered in symptomatic patients with IST (Class IIa, LOE: C) (1). Importantly, calcium-channel blockers and catheter ablation are not mentioned in the 2019 Guidelines' subsection on the therapy of IST.

#### Therapy of postural orthostatic tachycardia syndrome

Postural orthostatic tachycardia syndrome (POTS) is defined as a clinical syndrome usually characterized by an increase in the heart rate  $\geq 30$  beats per minute (bpm) when standing for >30 s and an absence of orthostatic hypotension (>20 mm Hg reduction in systolic blood pressure) (9). In the recent ESC Guidelines, there are some specific recommendations regarding POTS. In the document, it is stated that a regular and progressive exercise program should be considered (Class IIa, LOE: B) (1). Consumption of  $\geq 2$ –3 L of water and 10–12 g of sodium chloride daily may be considered (Class IIb, LOE: C) (1). Midodrine, a low-dose non-selective beta-blocker, ivabradine, or pyridostigmine may be considered (Class IIb, LOE: C) (1). Importantly, head-up sleeping, compression stockings, selective beta-blockers, fludrocortisone, clonidine, methylphenidate, fluoxetine, erythropoietin, ergotamine/octreotide, and phenobarbitone are not mentioned in the 2019 Guidelines' subsection on POTS.

#### Therapy of focal atrial tachycardia

There are new well-structured recommendations regarding the therapy of focal atrial tachycardia (AT) for acute setting in recent ESC guidelines (1). In patients with hemodynamic stability, adenosine (6–18 mg i.v. bolus) should be considered (Class IIa, LOE: B) (1). Intravenous beta-blockers should be considered for acute focal AT in the absence of decompensated HF if adenosine fails (Class IIa, LOE: C) (1). Similarly, verapamil or diltiazem should be considered in hemodynamically stable patients with AT in the absence of hypotension or HFrEF if adenosine fails (Class IIa, LOE: C) (1). Amiodarone, flecainide, and propafenone had Class IIa recommendation for treatment of focal AT in former ESC guidelines (2). The new ESC Guidelines suggest that i.v. ibutilide, amiodarone, flecainide, or propafenone may be used for

the acute treatment of focal AT if other measures fail (Class IIb, LOE: C) (1). Importantly, procainamide, sotalol, and digoxin are not mentioned in the 2019 Guidelines' subsection on the acute therapy of focal AT.

There is a new recommendation regarding ivabradine application in chronic treatment of focal AT. Use of ivabradine with a beta-blocker for chronic therapy of focal AT may be considered. The new guideline reduced the class of recommendation of beta-blockers or non-dihydropyridine calcium-channel blockers from I to IIa for chronic treatment of focal AT. Beta-blockers or non-dihydropyridine calcium-channel blockers (verapamil or diltiazem in the absence of HFrEF) should be considered if ablation is not desirable or feasible (Class IIa, LOE: C) (1). Amiodarone, sotalol, and disopyramide are not mentioned in the 2019 Guidelines' subsection on the chronic treatment of focal AT.

### Therapy of atrial flutter

New guidelines point out that data about the embolic risk of atrial flutter have usually been derived in the presence of concomitant AF, consequently making individualized risk stratification hard (1). The left atrial appendage stunning and thrombi seem to be lower compared to those in AF (10). The thromboembolic risk of atrial flutter, although lower than that of AF, is still significant (11). Although we have well-known risk scores for stroke in AF such as CHA<sub>2</sub>DS<sub>2</sub>-VASc [cardiac failure, hypertension, age $\geq$ 75 (doubled), diabetes, stroke (doubled)-vascular disease, age 65–74 and gender (female)] (12, 13), there is no specific assessment of these scores in solitary atrial flutter (14). Based on these facts, there is a new recommendation regarding anticoagulation in atrial flutter. The new guideline suggest that patients with atrial flutter without AF should be considered for anticoagulation, but the threshold for initiation is not established (Class IIa, LOE: C) (1).

There are some new recommendations and changes related to acute treatment of atrial flutter. Ibutilide (i.v.) and dofetilide (i.v. or oral; in-hospital) are recommended for conversion of atrial flutter (Class I, LOE: B) (1). In the recent guideline, propafenone and flecainide are not recommended for conversion to sinus rhythm in patients with macro re-entrant atrial arrhythmias (Class III, LOE: B) (1). Verapamil, diltiazem, or beta-blockers had Class I recommendation for rate control in atrial flutter in former guidelines (2). With the recent guideline, i.v. beta-blockers or non-dihydropyridine calcium-channel blockers (verapamil or diltiazem, i.v.) should be considered to control a rapid ventricular rate (Class IIa, LOE: B) (1). Invasive and non-invasive high-rate atrial pacing for the termination of atrial flutter had Class I (LOE: A) recommendation in former guidelines (2). However, atrial stimulation with percutaneous endocardial electrodes or from the esophagus are mostly practiced in pediatrics. Recent guidelines reduced the class of recommendation, and suggest that invasive and non-invasive high-rate atrial pacing may be considered for the termination of atrial flutter (Class IIb, LOE: B) (1). However, as a new recommen-

dation, high-rate atrial pacing is recommended for termination of atrial flutter in the presence of an implanted pacemaker or defibrillator (Class I, LOE: B) (1). Digitalis is not mentioned in the 2019 Guidelines' subsection on acute treatment for macro re-entrant atrial arrhythmias. Dofetilide, sotalol, flecainide, propafenone, procainamide, quinidine, and disopyramide are not mentioned under the subsection of the treatment for macro re-entrant atrial arrhythmias.

### Therapy of atrioventricular nodal re-entrant tachycardia

Acute therapy of atrioventricular nodal re-entrant tachycardia (AVNRT) is similar to the recommendation on acute management of narrow QRS tachycardias. Vagal maneuvers, preferably in the supine position with leg elevation, are recommended (Class I, LOE: B) (1). In current guidelines, verapamil or diltiazem i.v. should be considered if vagal maneuvers and adenosine fail (Class IIa, LOE: B) (1). Similarly, beta-blockers (i.v. esmolol or metoprolol) should be considered if vagal maneuvers and adenosine fail (Class IIa, LOE: C) (1).

There are some important recommendations regarding chronic AVNRT therapy in current ESC Guidelines. Catheter ablation is recommended for symptomatic, recurrent AVNRT (Class I, LOE: B)[1]. An abstinence from therapy should be considered for minimally symptomatic patients with very infrequent, short-lived episodes of tachycardia (Class IIa, LOE: C) (1). Chronic treatment with non-dihydropyridine calcium-channel blockers or beta-blockers had class I recommendations in the previous guideline. Recent guidelines state that diltiazem or verapamil, in patients without HFrEF, or beta-blockers, should be considered if ablation is not desirable or feasible (Class IIa, LOE: B) (1). Notably, amiodarone, sotalol, flecainide, propafenone, and the "pill-in-the-pocket" approach are not mentioned in the 2019 Guidelines on the AVNRT therapy.

### Therapy of atrioventricular re-entrant tachycardia

There are some important changes in the management of patients with atrioventricular re-entrant tachycardia (AVRT). As a new statement for acute setting, i.v. amiodarone is not recommended for pre-excited AF. In addition to amiodarone, digoxin, beta-blockers, diltiazem, and verapamil are not recommended and are potentially harmful in patients with pre-excited AF (Class III, LOE: B) (1). Regarding chronic treatment, propafenone or flecainide may be considered in patients with AVRT and without ischemic or structural heart disease, if ablation is not desirable or feasible (Class IIb, LOE: B) (1). Propafenone and flecainide had Class IIa recommendation in former guidelines (2).

Beta-blockers had Class IIb recommendation for chronic treatment of AVRT in previous 2003 ESC Guidelines (2). Recent guidelines upgraded the class of recommendation to IIa and state that beta-blockers or non-dihydropyridine calcium-channel blockers (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 (Class IIa, LOE: B) (1). In chronic treat-

ment of the AVRT subsection, amiodarone, sotalol, and the “pill-in-the-pocket” approach are not mentioned.

### Asymptomatic pre-excitation

In the new guidelines, asymptomatic pre-excitation has a dedicated algorithm for its screening and management. Most patients with an asymptomatic pre-excitation will live without any clinical events related to their ventricular pre-excitation, and approximately 20% of patients will develop an arrhythmia related to their accessory pathway (AP) during the follow-up. The most common arrhythmia in patients with the WPW syndrome is AVRT (80%), followed by a 20%–30% incidence of AF. Sudden cardiac death secondary to pre-excited AF that conducts rapidly to the ventricle over the AP, resulting in ventricular fibrillation, is the most feared manifestation of the WPW syndrome. Therefore, the management of patients with asymptomatic pre-excitation has a special importance. Among recent document recommendations, as a new statement, performance of an electrophysiological study to risk-stratify individuals with asymptomatic pre-excitation should be considered in asymptomatic pre-excitation (Class IIa, LOE: B) (1).

Catheter ablation is recommended in asymptomatic patients in whom electrophysiology testing with the use of isoprenaline identifies high-risk properties, such as the shortest pre-excited RR interval during AF (SPERRI)  $\leq 250$  ms, AP effective refractory period  $\leq 250$  ms, multiple APs, and an inducible AP-mediated tachycardia (Class I, LOE: B) (1). Non-invasive evaluation of the conducting properties of the AP in individuals with asymptomatic pre-excitation may be considered (Class IIb, LOE: B) (1). Catheter ablation may be considered in patients with asymptomatic pre-excitation and low-risk AP at invasive or non-invasive risk stratification (Class IIb, LOE: C) (1). There has also been evidence supporting the concept of LV dysfunction related to electrical activation in patients with asymptomatic pre-excitation. Catheter ablations should be considered in patients with asymptomatic pre-excitation and LV dysfunction due to electrical desynchrony (Class IIa, LOE: C) (1).

### SVT in pregnancy

SVT in pregnancy is not infrequent during daily practice. Recent guidelines have new recommendations regarding this issue. The document recommends that during the first trimester of pregnancy, it is recommended that all antiarrhythmic drugs are avoided, if possible (Class I, LOE: C) (1). Use of verapamil had Class IIb recommendation in former guidelines (2). In recent guidelines, beta-1 selective (except atenolol) beta-blockers or verapamil, in order of preference, should be considered for the prevention of SVT in patients without the WPW syndrome (Class IIa, LOE: C) (1). As a new recommendation flecainide or propafenone should be considered in the prevention of SVT in patients with the WPW syndrome and without ischemic or structural heart disease in pregnant patients (Class IIa, LOE: C) (1). Fluoroless catheter ablation should be considered in cases of

drug-refractory or poorly tolerated SVT in experienced centers (Class IIa, LOE: C) (1).

### Tachycardia-induced cardiomyopathy

Tachycardia-induced cardiomyopathy, or more accurately, arrhythmia-induced cardiomyopathy, is defined as the LV systolic dysfunction due to supraventricular or ventricular arrhythmia, which can be either sustained or paroxysmal, or is characterized by a highly frequent ectopic activity (1, 15). Its treatment changes according to underlying arrhythmia and mechanisms. As a new recommendation, the AV nodal ablation with subsequent pacing (“ablate and pace”), either biventricular or His bundle pacing, is recommended if the tachycardia responsible for the TCM cannot be ablated or controlled by drugs (Class I, LOE: C) (1).

## Conclusion

The new 2019 ESC Guidelines for the management of patients with SVT comprehensively reviewed the published evidence and summarized current developments. It provided specific recommendations for professionals participating in the care of patients presenting with SVT. Major changes in the recent documents are related to medical treatment. It has become clear that while drugs still have a place in the acute setting, they are generally not appropriate for long-term use. Today, catheter ablation has a much more prominent place in the treatment of symptomatic patients with SVT.

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## References

1. Brugada J, Katritsis DG, Arbelo E, Arribas F, Bax JJ, Blomström-Lundqvist C, et al.; ESC Scientific Document Group. 2019 ESC Guidelines for the management of patients with supraventricular tachycardia The Task Force for the management of patients with supraventricular tachycardia of the European Society of Cardiology (ESC). *Eur Heart J* 2019 Aug 31; pii: ehz467. [Epub ahead of print]
2. Blomström-Lundqvist C, Scheinman MM, Aliot EM, Alpert JS, Calkins H, Camm AJ, et al.; European Society of Cardiology Committee, NASPE-Heart Rhythm Society. ACC/AHA/ESC guidelines for the management of patients with supraventricular arrhythmias-executive summary. a report of the American college of cardiology/American heart association task force on practice guidelines and the European society of cardiology committee for practice guidelines (writing committee to develop guidelines for the man-

- agement of patients with supraventricular arrhythmias) developed in collaboration with NASPE-Heart Rhythm Society. *J Am Coll Cardiol* 2003; 42: 1493-531. [\[CrossRef\]](#)
3. Katritsis DG, Boriani G, Cosio FG, Hindricks G, Jais P, Josephson ME, et al. European Heart Rhythm Association (EHRA) consensus document on the management of supraventricular arrhythmias, endorsed by Heart Rhythm Society (HRS), Asia-Pacific Heart Rhythm Society (APHRS), and Sociedad Latinoamericana de Estimulación Cardíaca y Electrofisiología (SOLAECE). *Eur Heart J* 2018; 39: 1442-5.
  4. Page RL, Joglar JA, Caldwell MA, Calkins H, Conti JB, Deal BJ, et al. 2015 ACC/AHA/HRS Guideline for the Management of Adult Patients With Supraventricular Tachycardia: A Report of the American College of Cardiology/American Heart Association Task Force on Clinical Practice Guidelines and the Heart Rhythm Society. *J Am Coll Cardiol* 2016; 67: e27-e115.
  5. Calkins H, Hindricks G, Cappato R, Kim YH, Saad EB, Aguinaga L, et al. 2017 HRS/EHRA/ECAS/APHRS/SOLAECE expert consensus statement on catheter and surgical ablation of atrial fibrillation. *Europace* 2018; 20: e1-e160.
  6. Waxman HL, Myerburg RJ, Appel R, Sung RJ. Verapamil for control of ventricular rate in paroxysmal supraventricular tachycardia and atrial fibrillation or flutter: a double-blind randomized cross-over study. *Ann Intern Med* 1981; 94: 1-6. [\[CrossRef\]](#)
  7. Stambler BS, Dorian P, Sager PT, Wight D, Douville P, Potvin D, et al. Etripamil Nasal Spray for Rapid Conversion of Supraventricular Tachycardia to Sinus Rhythm. *J Am Coll Cardiol* 2018; 72: 489-97.
  8. Ortiz M, Martin A, Arribas F, Coll-Vinent B, Del Arco C, Peinado R, et al. Randomized comparison of intravenous procainamide vs. intravenous amiodarone for the acute treatment of tolerated wide QRS tachycardia: the PROCAMIO study. *Eur Heart J* 2017; 38: 1329-35.
  9. Sheldon RS, Grubb BP 2nd, Olshansky B, Shen WK, Calkins H, Brignole M, et al. 2015 heart rhythm society expert consensus statement on the diagnosis and treatment of postural tachycardia syndrome, inappropriate sinus tachycardia, and vasovagal syncope. *Heart Rhythm* 2015; 12: e41-63. [\[CrossRef\]](#)
  10. Schmidt H, von der Recke G, Illien S, Lewalter T, Schimpf R, Wolpert C, et al. Prevalence of left atrial chamber and appendage thrombi in patients with atrial flutter and its clinical significance. *J Am Coll Cardiol* 2001; 38: 778-84. [\[CrossRef\]](#)
  11. Chen YL, Lin YS, Wang HT, Liu WH, Chen HC, Chen MC. Clinical outcomes of solitary atrial flutter patients using anticoagulation therapy: a national cohort study. *Europace* 2019; 21: 313-21. [\[CrossRef\]](#)
  12. Lip GY, Nieuwlaat R, Pisters R, Lane DA, Crijns HJ. Refining clinical risk stratification for predicting stroke and thromboembolism in atrial fibrillation using a novel risk factor-based approach: the euro heart survey on atrial fibrillation. *Chest* 2010; 137: 263-72. [\[CrossRef\]](#)
  13. Lip GYH, Banerjee A, Boriani G, Chiang CE, Fargo R, Freedman B, et al. Antithrombotic Therapy for Atrial Fibrillation: CHEST Guideline and Expert Panel Report. *Chest* 2018; 154: 1121-201. [\[CrossRef\]](#)
  14. Kirchhof P, Benussi S, Kotecha D, Ahlsson A, Atar D, Casadei B, et al. 2016 ESC Guidelines for the management of atrial fibrillation developed in collaboration with EACTS. *Eur Heart J* 2016; 37: 2893-962. [\[CrossRef\]](#)
  15. Ulus T, Okyay K, Kabul HK, Ozcan EE, Ozeke O, Altay H, et al. Turkish Society of Cardiology consensus paper on management of arrhythmia-induced cardiomyopathy. *Anatol J Cardiol* 2019; 21: 98-106.