

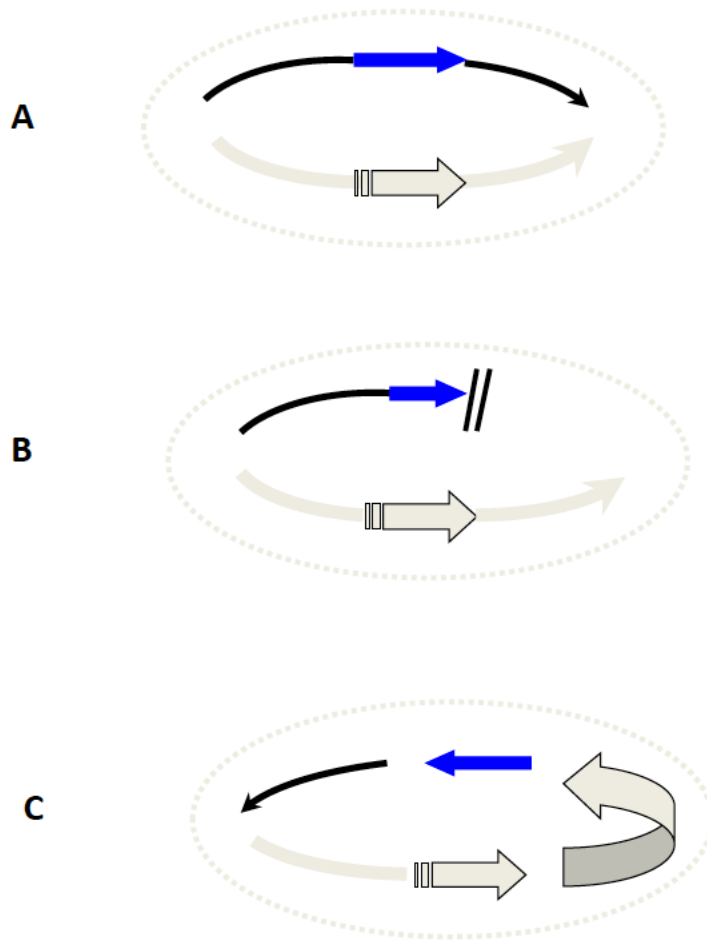


Figure 1. Theoretical depiction of the AV nodal reentrant circuit. During sinus rhythm (A) the impulse penetrates both the fast and slow pathway.

A premature beat results in conduction block of the fast pathway and propagation through the slow (B). An earlier impulse encounters more delay in the slow pathway in a way that the blocked fast pathway has recovered when the now retrograde impulse arrives and tachycardia begins (C).

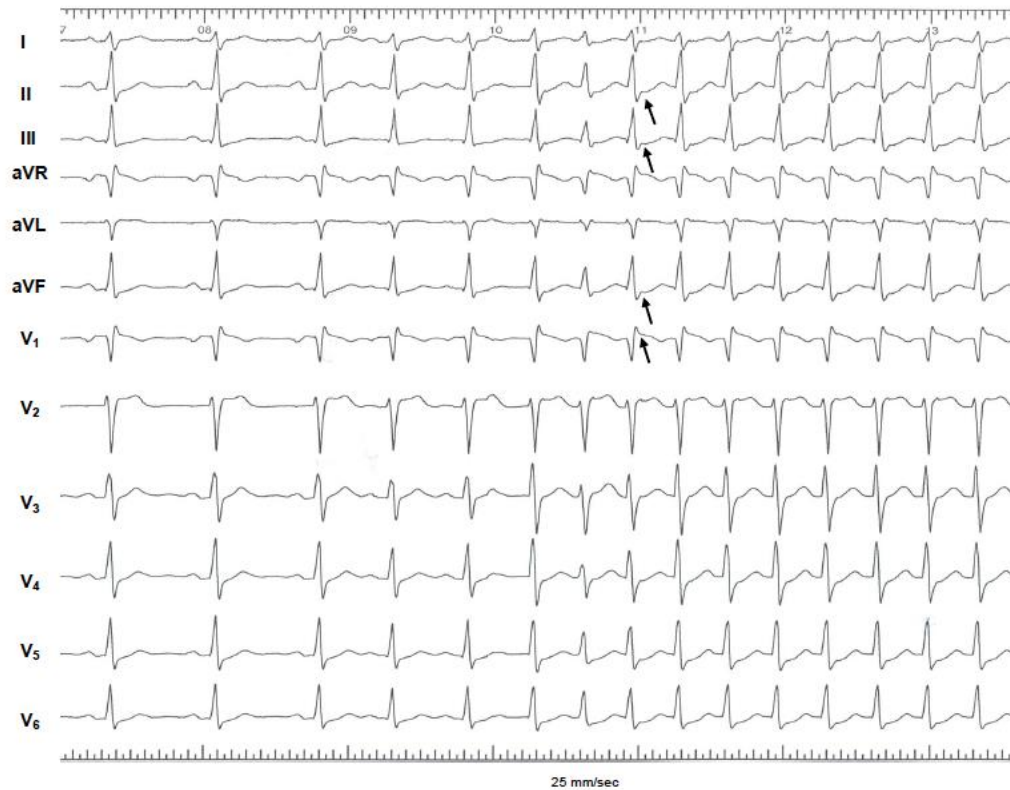


Figure 2. Induction of typical AVJRT by atrial ectopy.

The first three beats are sinus beats. The next two are atrial ectopics conducted with a short PR (apparently over the fast pathway). The next atrial ectopic is conducted with a prolonged PR over the slow pathway due to antegrade block of the fast pathway and initiates AVJRT by returning retrogradely through the fast pathway that has recovered. Retrograde P' waves are more prominent in lead V₁ and, especially, the inferior leads (arrows).

Katritsis DG, Camm AJ. Atrioventricular nodal re-entrant tachycardia. *Circulation* 2010; 122:831-840.

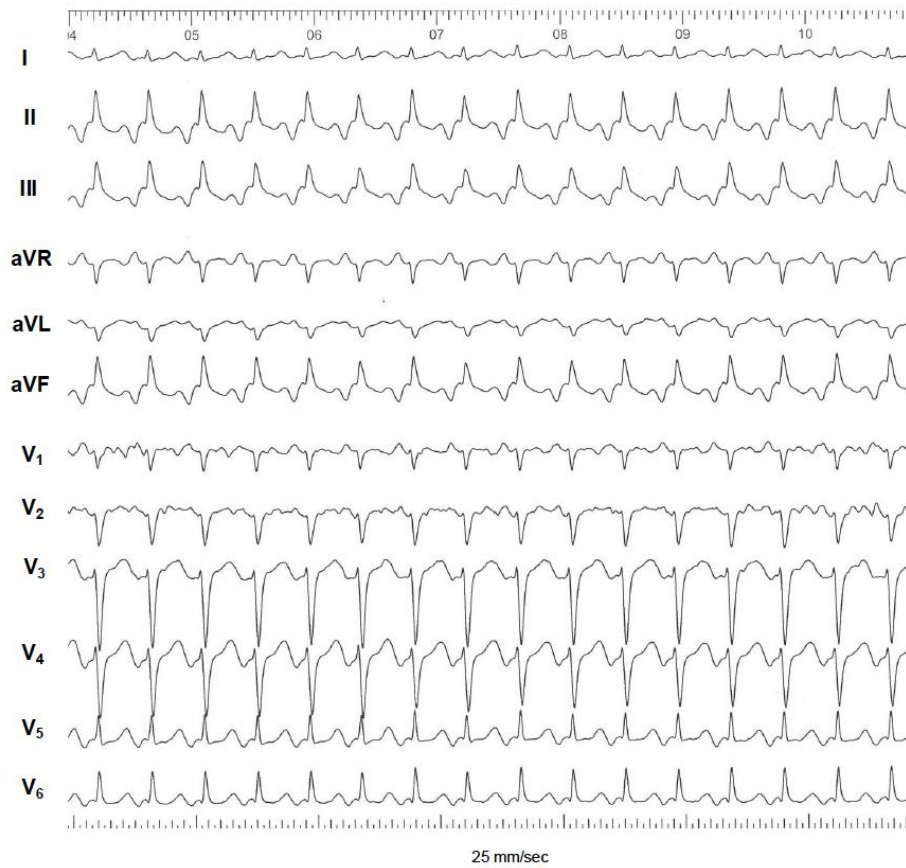


Figure 3. Long RP tachycardia due to atypical AVJRT. Note negative P waves in inferior leads but positive P wave in lead V1.

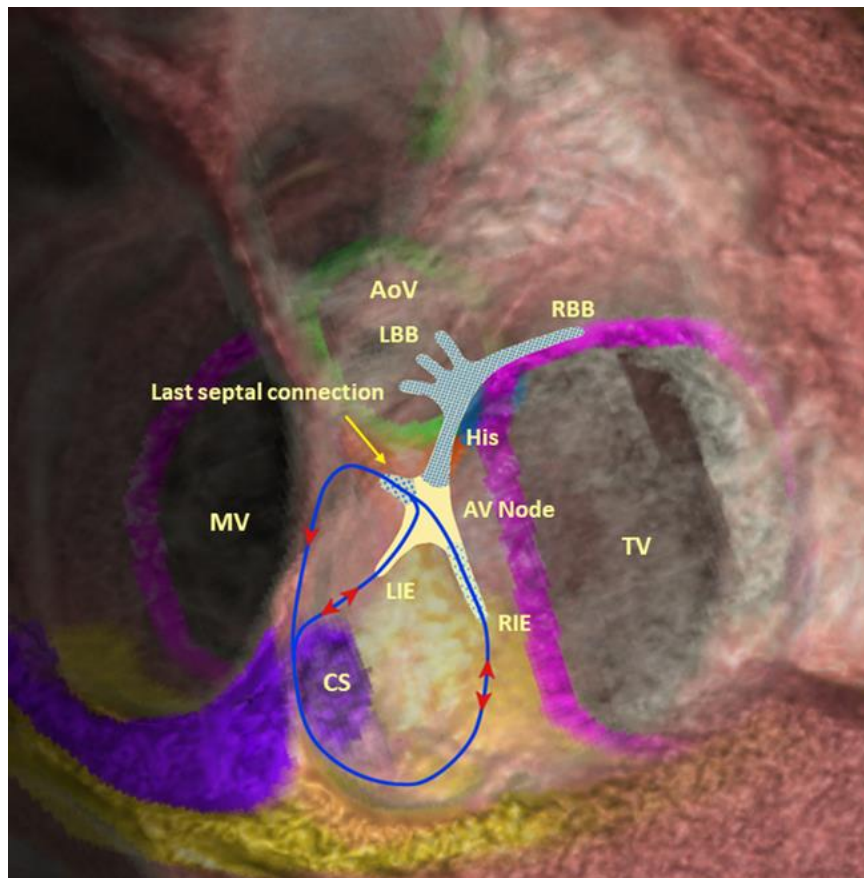


Figure 4. Proposed model for the circuit of typical AVJRT as mapped and measured on the right septal aspect of the pyramid of Koch.

The left inferior extension may also be implicated and create a typical form using the same “last” atrial input to the AV node, or an atypical one using the right extension as the other limb. The right and left bundles and the bundle of His have been superimposed from the histological sections. The density of blue dots corresponds to relative conduction velocities, as indicated by in vitro measurements, embryologic data, and connexin expression in relevant tissues.

AoV: aortic valve; MV: mitral valve; TV: tricuspid valve; CS: coronary sinus; RIE: right inferior nodal extension; LIE: left inferior nodal extension.

Katritsis DG, Anderson RH. New Insights Into the Mechanisms of Fast and Slow Conduction in the Atrioventricular Node. *Heart Rhythm*, 2022.

Table 1. Long RP' Tachycardias

1. Sinus Tachycardia
2. Atrial Tachycardia
3. Atypical atrioventricular Nodal Reentrant Tachycardia
4. Atrioventricular reentrant tachycardia due to slowly conducting concealed accessory pathways
5. Non-paroxysmal junctional tachycardia with 1:1 retrograde conduction

Table 2. Classification of AVNRT types. Variable retrograde atrial activation has been described for all types.

Conventional classification			
	AH/HA	VA (His)	Usual ERAA
Typical AVNRT			
Slow-fast	>1	<60 ms	RHis, CS os, LHis
Atypical AVNRT			
Fast-slow	<1	>60 ms	CS os, LRIAS, dCS
Slow-slow	>1	>60 ms	CS os, dCS
New proposed classification			
	HA	VA (His)	AH/HA
Typical AVNRT	≤70 ms	≤60 ms	>1
Atypical AVNRT	>70 ms	>60 ms	Variable

AH, atrial to His interval; HA, His to atrium interval; VA, interval measured from the onset of ventricular activation on surface ECG to the earliest deflection of the atrial activation in the His bundle electrogram; ERAA, earliest retrograde atrial activation; RHis, His bundle electrogram recorded from the right septum; LHis, His bundle electrogram recorded from the left septum; LRIAS, low right atrial septum; CS os, ostium of the coronary sinus; dCS, distal coronary sinus. Atypical AVNRT has been traditionally classified as fast-slow (HA>70 ms, VA>60, AH/HA<1, and AH<200 ms) or slow-slow (HA>70 ms, VA>60 ms, AH/HA>1, and AI>200 ms). Not all of these criteria are always met and atypical AVNRT may not be sub-classified accordingly.

AH: atrial to His interval, HA: His to atrium interval, VA: interval measured from the onset of ventricular activation on surface ECG to the earliest deflection of the atrial activation on the His bundle electrogram.

Katritsis DG, Camm AJ. Atrioventricular nodal reentrant tachycardia. *Circulation*. 2010;122:831–40 with permission from Wolters Kluwer.

Katritsis DG, Josephson ME. Classification of electrophysiological types of atrioventricular nodal re-entrant tachycardia: a reappraisal. *Europace*. 2013;Apr 23.

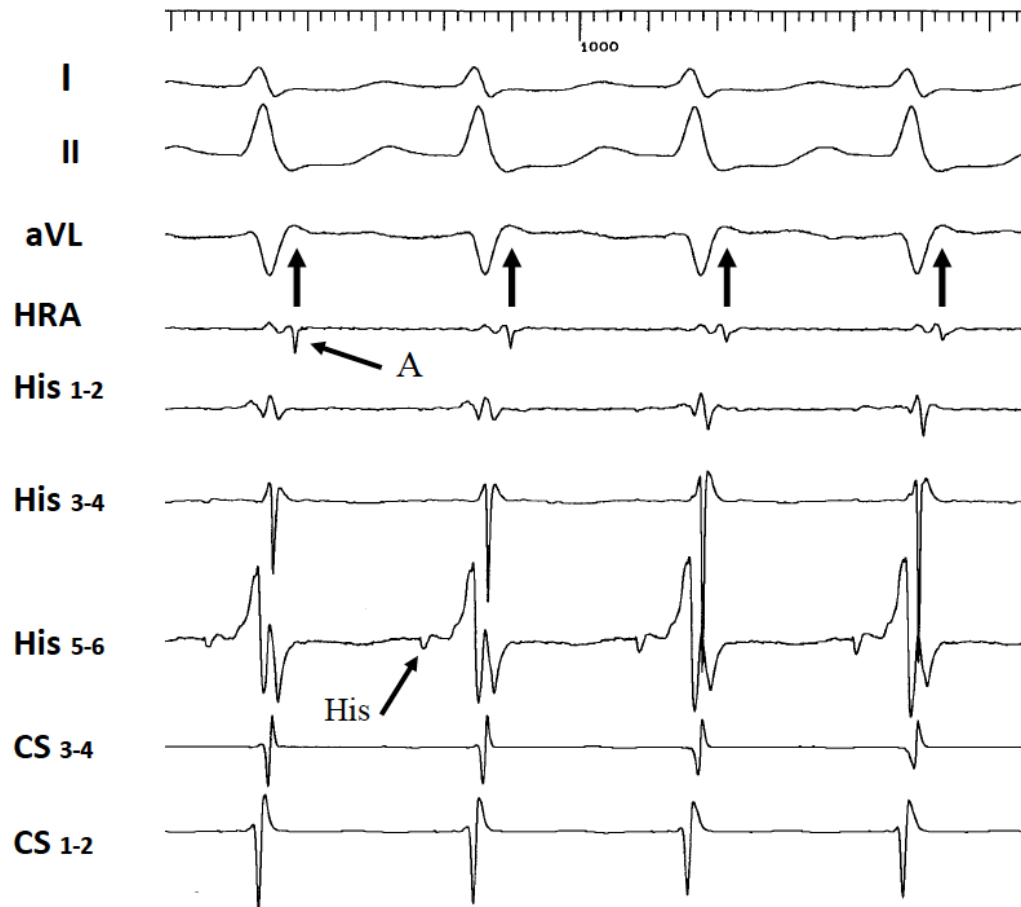


Figure 5. Electrograms during slow-fast AVJRT.

The A-H interval (as measured from the A on the HRA electrode to the His of the His bundle electrode) is longer than the H-A. Small P' waves at the end of QRS correspond to retrograde atrial conduction (arrows).

I: ECG lead, II: lead II of the surface ECG, aVL: lead aVL of the surface ECG, HRA: high right atrium, His: His bundle, CS: coronary sinus, A: atrial electrogram, His: His bundle electrogram.

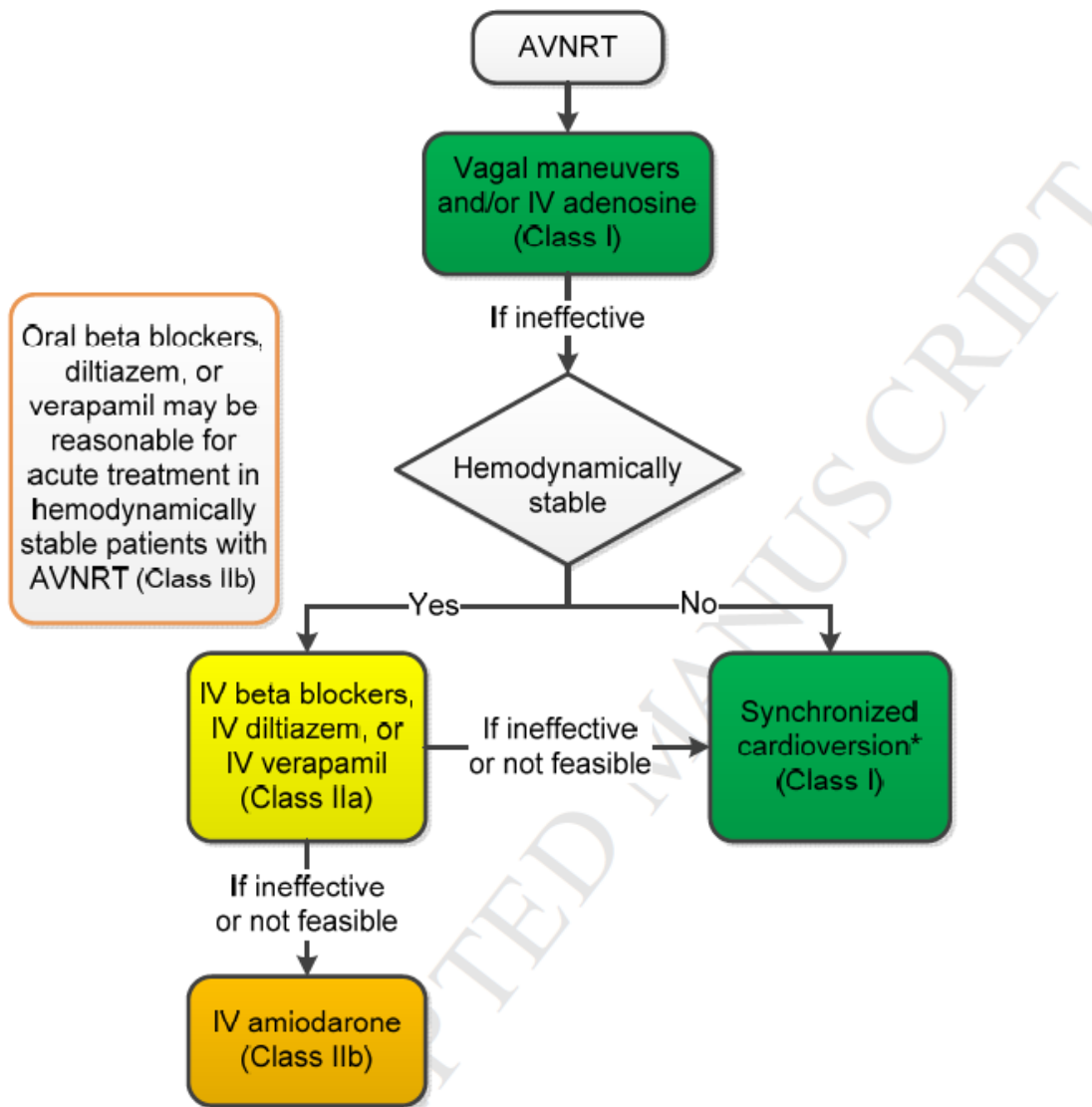


Figure 6. ACC/AHA/HRS 2015 GL on SVT. Acute treatment of AVJRT.

Drugs listed alphabetically.

*For rhythms that break or recur spontaneously, synchronized cardioversion is not appropriate.

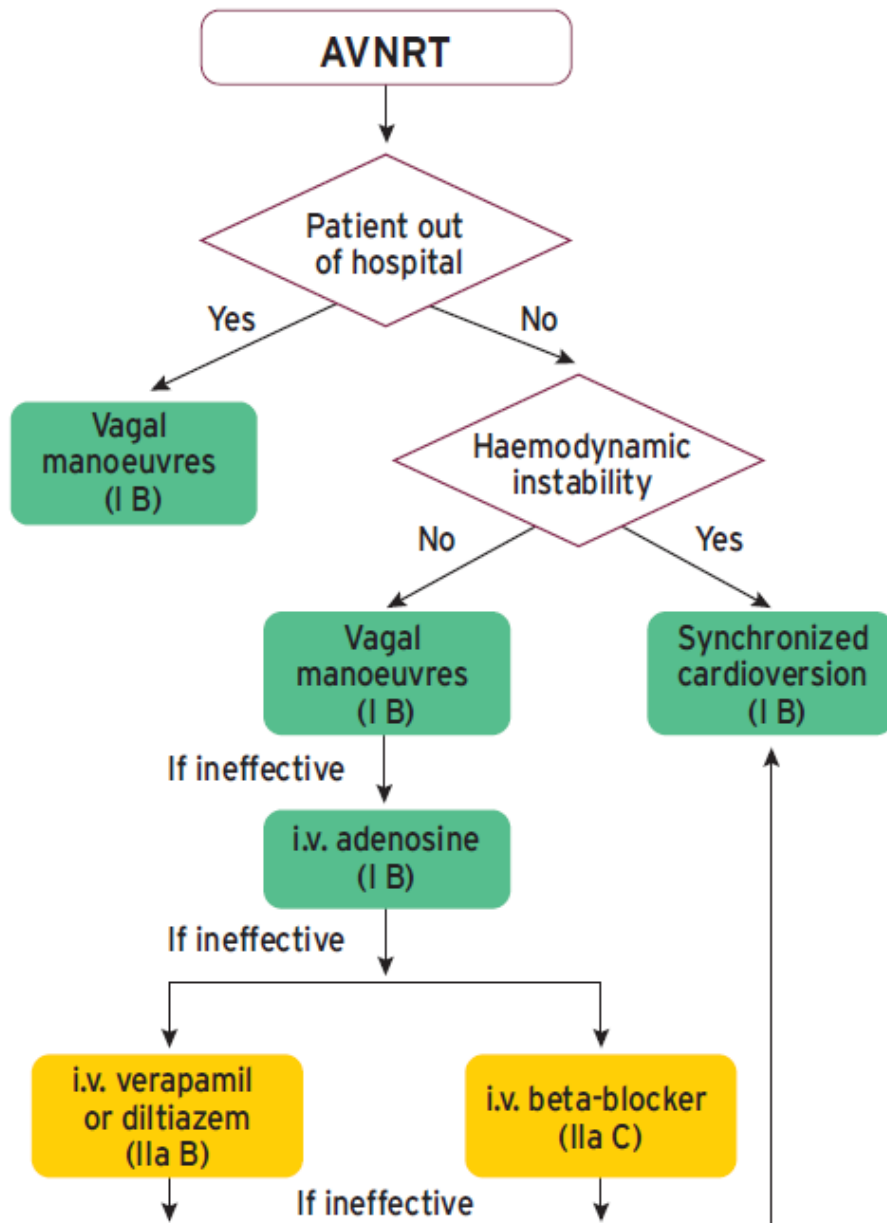


Figure 7. ESC 2019 GL on SVT. Acute therapy of AVJRT.

AVJRT = atrioventricular nodal re-entrant tachycardia; SVT = supraventricular tachycardia.

Table 3. Therapy of AVNRT**ACC/AHA/HRS 2015 GL on SVT. AVNRT**

Acute treatment	
Vagal maneuvers	I-B-R
Adenosine	I-B-R
Synchronized cardioversion for hemodynamically unstable patients when adenosine and vagal maneuvers do not terminate the tachycardia or are not feasible	I-B-NR
Synchronized cardioversion for hemodynamically stable patients when pharmacological therapy is ineffective or contraindicated	I-B-NR
IV beta blockers, diltiazem, or verapamil for hemodynamically stable patients	IIa-B-R
Oral beta blockers, diltiazem, or verapamil for hemodynamically stable patients	IIb-C-LD
IV amiodarone for hemodynamically stable patients when pharmacological therapy is ineffective or contraindicated	IIb-C-LD
Ongoing management	
Verapamil or diltiazem in patients who are not candidates for catheter ablation	I-B-R
Catheter ablation of the slow pathway	I-B-NR
Beta blockers in patients who are not candidates for catheter ablation	I-B-R
Flecainide or propafenone in patients without structural heart disease or ischemic heart disease and not candidates for, or prefer not to undergo, catheter ablation and in whom beta blockers, diltiazem, or verapamil are ineffective or contraindicated	IIa-B-R
Clinical follow-up without pharmacological therapy or ablation in minimally symptomatic patients	IIa-B-NR
Sotalol or dofetilide or digoxin or amiodarone in patients who are not candidates for catheter ablation	IIb-B-R
Self-administered ("pill-in-the-pocket") acute doses of oral beta blockers, diltiazem, or verapamil for infrequent, well-tolerated episodes of AVNRT	IIb-C-LD

ACC/AHA/HRS 2015 Guideline for the management of adult patients with supraventricular tachycardia. *J Am Coll Cardiol.* 2015; doi:10.1016/j.jacc.2015.08.856 with permission from Elsevier.

ESC 2019 GL on SVT. Recommendations for the management of atrioventricular nodal re-entrant tachycardia (AVNRT)

Acute therapy		
<i>Haemodynamically unstable patients</i>		
Synchronized direct-current cardioversion for haemodynamically unstable patients.	I	B
<i>Haemodynamically stable patients</i>		
Vagal manoeuvres, preferably in the supine position with leg elevation.	I	B
Adenosine (6–18 mg i.v. bolus) if vagal manoeuvres fail.	I	B
i.v. verapamil or diltiazem if vagal manoeuvres and adenosine fail.	IIa	B
i.v. beta-blockers (esmolol or metoprolol) if vagal manoeuvres and adenosine fail.	IIa	C
Synchronized direct-current cardioversion when drug therapy fails to convert or control the tachycardia.	I	B
<i>Long-term therapy</i>		
Catheter ablation for symptomatic, recurrent AVNRT.	I	B
Diltiazem or verapamil, in patients without HFrEF, or beta blockers if ablation is not desirable or feasible.	IIa	B
Abstain from therapy in minimally symptomatic patients with very infrequent, short-lived episodes of tachycardia.	IIa	C

i.v. verapamil and diltiazem are contraindicated in the presence of hypotension or HFrEF.

i.v. beta-blockers are contraindicated in the presence of decompensated heart failure.

HFrEF = heart failure with reduced left ventricular ejection fraction; i.v. = intravenous.

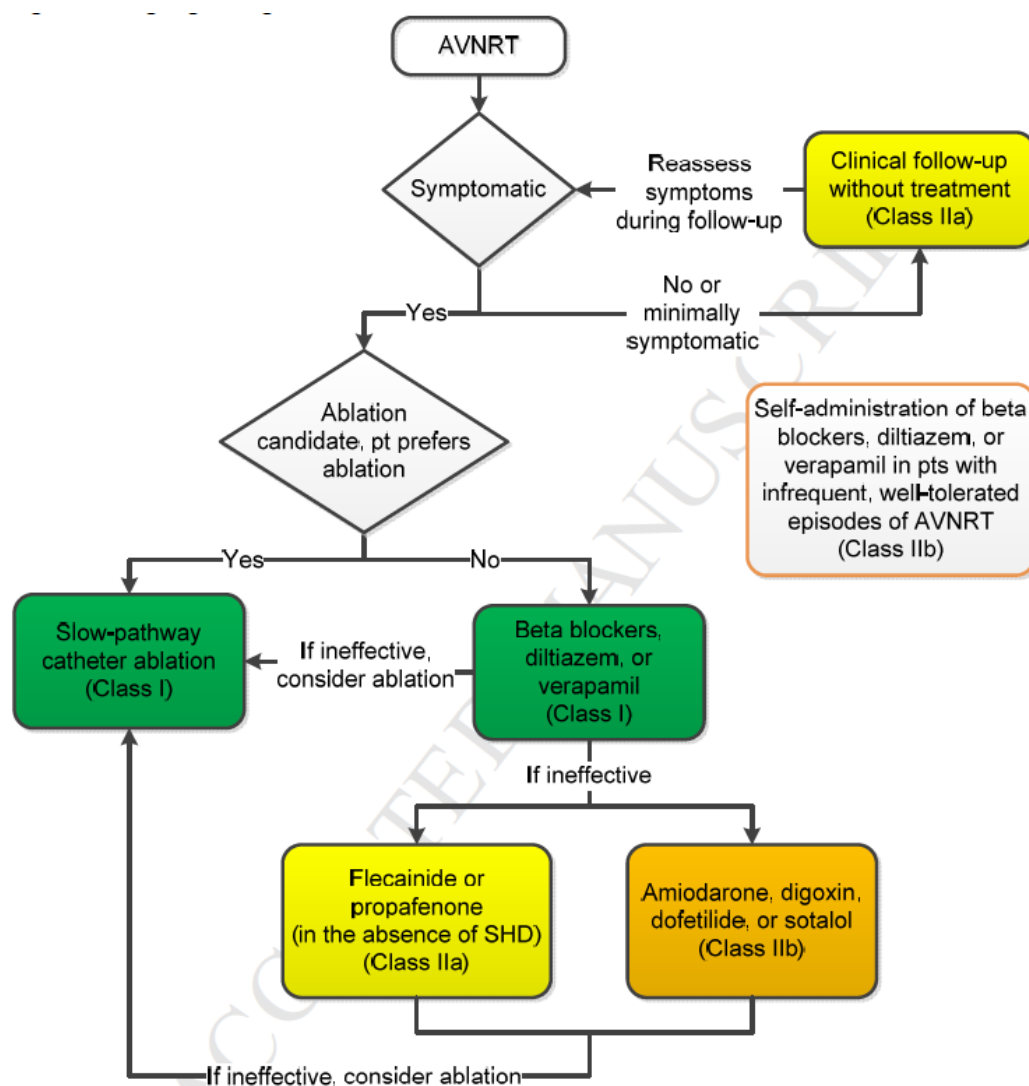


Figure 8. ACC/AHA/HRS 2015 GL on SVT. Ongoing management of AVJRT.

Drugs listed alphabetically.

SHD: structural heart disease (including ischemic heart disease).

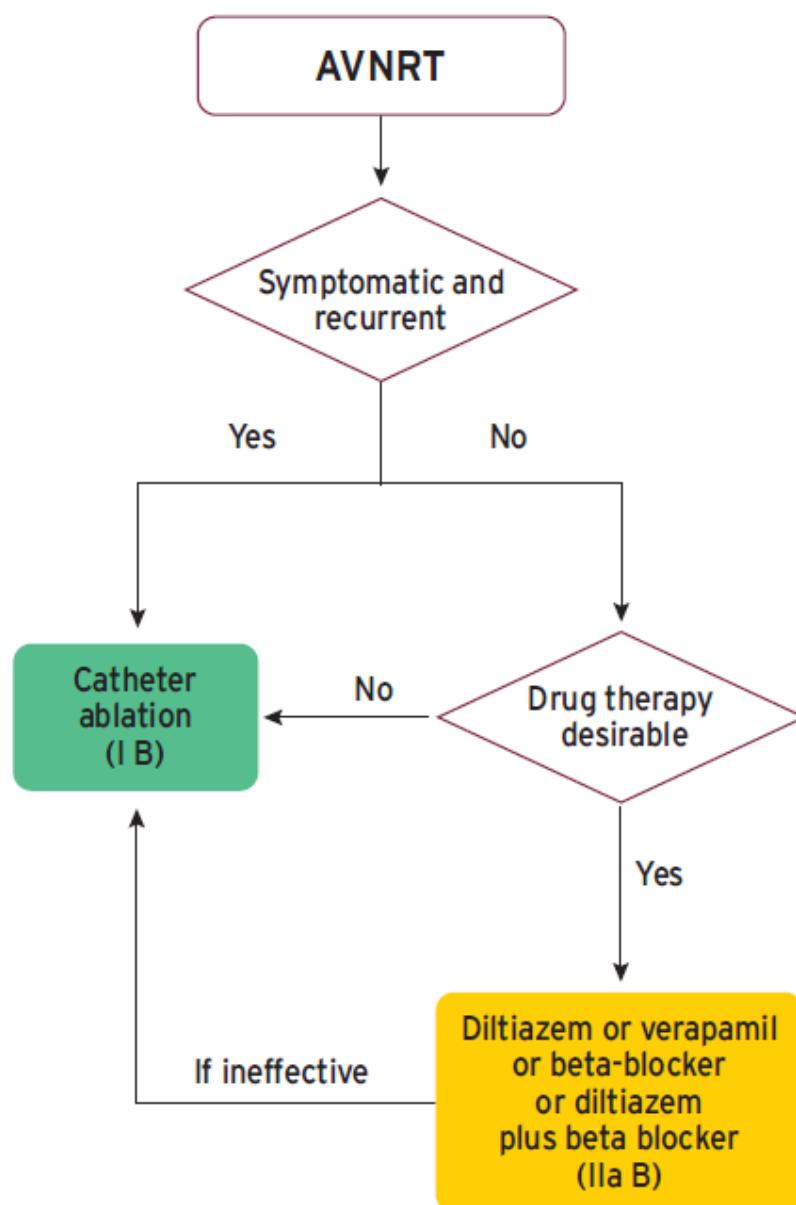


Figure 9. ESC 2019 GL on SVT. Chronic therapy of AVJRT.

Oral verapamil and diltiazem are contraindicated in the presence of HFrEF.

AVJRT = atrioventricular nodal re-entrant tachycardia; HFrEF = heart failure with reduced left ventricular ejection fraction

Table 4. ACC/AHA/HRS 2015 GL on SVT. Therapy of junctional tachycardia

IV beta blockers in symptomatic junctional tachycardia	Ila-C-LD
IV diltiazem, procainamide, or verapamil in junctional tachycardia	Ila-C-LD
Ongoing management	
Beta blockers	Ila-C-LD
Diltiazem or verapamil	Ila-C-LD
Flecainide or propafenone in patients without structural heart disease or ischemic heart disease	Iib-C-LD
Catheter ablation when medical therapy is not effective or contraindicated	Iib-C-LD

ACC/AHA/HRS 2015 Guideline for the management of adult patients with supraventricular tachycardia. *J Am Coll Cardiol.* 2015;doi:10.1016/j.jacc.2015.08.856 with permission from Elsevier.

**Figure 10.** Junctional ectopic tachycardia in an apparently normal heart.

Margulescu AD, Thomas DE. An Irregular Tachycardia Not Responsive to Medical Treatment: What Is the Diagnosis? *Circulation.* 2020;141:863-865.

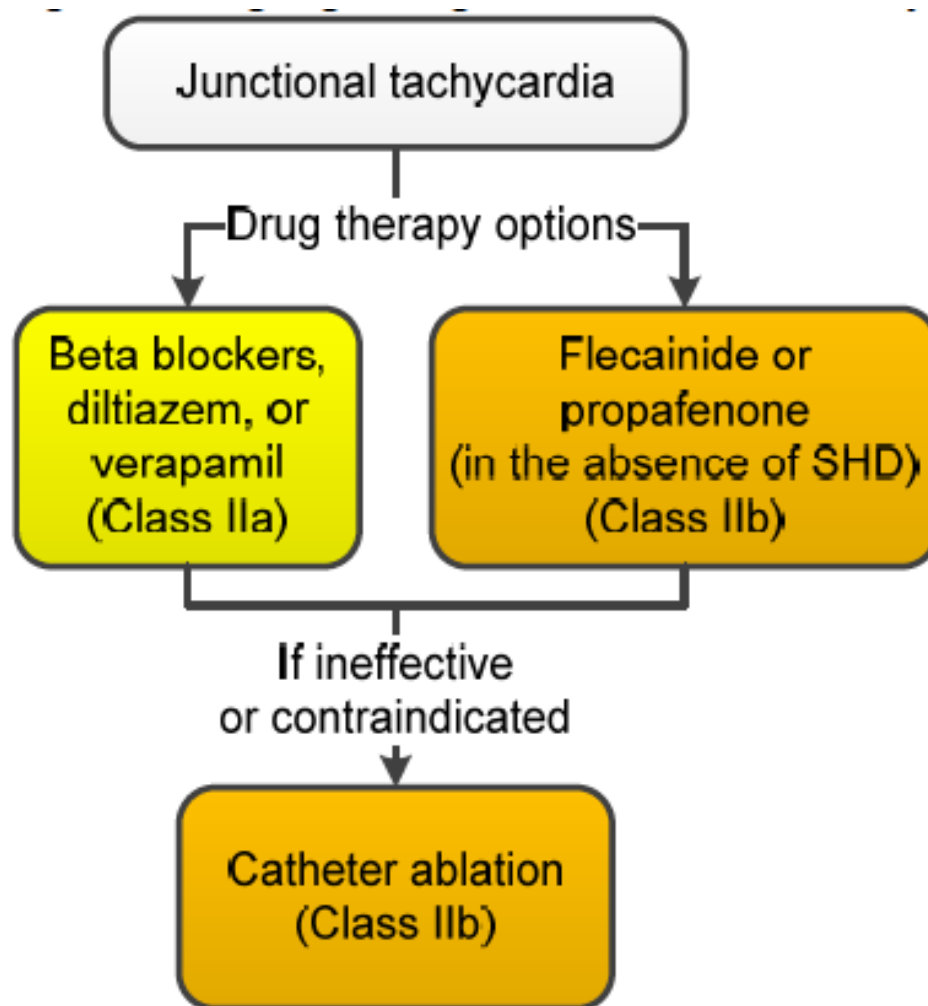


Figure 11. ACC/AHA/HRS 2015 GL on SVT. Ongoing management of junctional tachycardia.

Drugs listed alphabetically.

SHD: structural heart disease (including ischemic heart disease).