

The Role of VT Ablation in the Latest Guideline

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Guidelines for ventricular arrhythmias

- 2009 EHRA/HRS Expert Consensus on Catheter Ablation of Ventricular Arrhythmias
- 2014 EHRA/HRS/APHRS Expert Consensus on Ventricular Arrhythmias
- 2015 ESC Guidelines for the management of patients with ventricular arrhythmias and the prevention of sudden cardiac death

Catheter ablation of VT

- PVC/NSVT/sustained VT
- Monomorphic/polymorphic
- Structural heart disease
 - Ischemic cardiomyopathy
 - Non-ischemic cardiomyopathy
- Etc

Sustained Monomorphic Ventricular Tachycardia (SMVT)

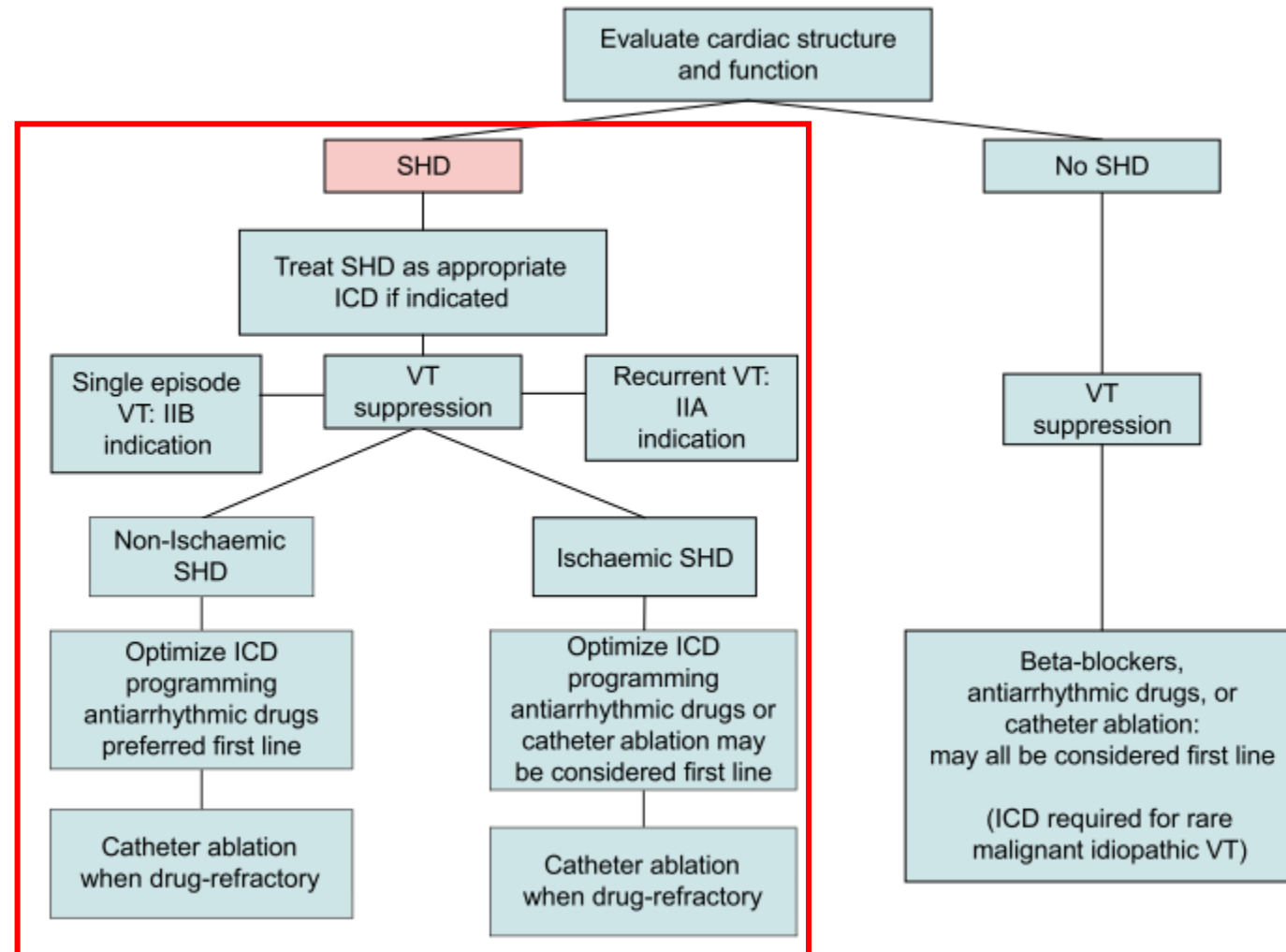
1. Structural heart disease
2. No structural heart disease

2015 ESC

Catheter ablation for the treatment of sustained monomorphic ventricular tachycardia

Recommendations	Class ^a	Level ^b	Ref. ^c
Urgent catheter ablation is recommended in patients with scar-related heart disease presenting with incessant VT or electrical storm.	I	B	183
Catheter ablation is recommended in patients with ischaemic heart disease and recurrent ICD shocks due to sustained VT.	I	B	184–186
Catheter ablation as first-line therapy is recommended in patients presenting with bundle branch re-entrant tachycardia.	I	C	345, 346
Catheter ablation should be considered after a first episode of sustained VT in patients with ischaemic heart disease and an ICD.	IIa	B	184–186
Catheter ablation may be considered in patients with DCM and VA not caused by bundle branch re-entry refractory to medical therapy.	IIb	C	355

Sustained Monomorphic VT (SMVT)



Structural heart disease

- Class I [ESC, HRS]
 - Incessant VT or electrical storm
 - Bundle branch re-entrant tachycardia
- Recurrent ICD shocks due to sustained VT [Class I (ESC), Class IIa (HRS)]
- Single episode of sustained VT [Class IIa (ESC), Class IIb (HRS)]

Sustained Monomorphic VT (SMVT)

- In patients with prior MI, reduced EF, and haemodynamically stable VT, catheter ablation significantly reduces recurrence of VT.
- The long term effectiveness of catheter ablation for non-ischemic cardiomyopathies has been less well studied.
- Catheter ablation is the preferred therapy for patients presenting with incessant sustained MMVT.

Without structural heart disease

- Outflow tract VT (OT-VT)
- Idiopathic left VT (ILVT)

OT-VT

Treatment of outflow tract ventricular tachycardia

Recommendations	Class ^a	Level ^b	Ref. ^c
Catheter ablation of <u>RVOT VT/PVC</u> is recommended in <u>symptomatic patients</u> and/or in patients with a failure of <u>anti-arrhythmic drug therapy</u> (e.g. <u>beta-blocker</u>) or in patients with a <u>decline in LV function</u> due to RVOT-PVC burden.	I	B	525–528
Treatment with sodium channel blockers (class IC agents) is recommended in LVOT/aortic cusp/epicardial VT/PVC symptomatic patients.	I	C	529–531
Catheter ablation of <u>LVOT/aortic cusp/epicardial VT/PVC</u> by experienced operators after <u>failure of one or more sodium channel blockers</u> (class IC agents) or in patients not wanting long-term anti-arrhythmic drug therapy should be considered <u>in symptomatic patients</u> .	IIa	B	195, 531–533

ILVT

Treatment to prevent recurrence of idiopathic ventricular tachycardia

Recommendations	Class ^a	Level ^b	Ref. ^c
Catheter ablation by experienced operators is recommended as a <u>first-line treatment in symptomatic patients with idiopathic left VTs.</u>	I	B	346, 347, 563–575
When catheter ablation is not available or desired, treatment with beta-blockers, verapamil or sodium channel blockers (class IC agents) is recommended in symptomatic patients with idiopathic left VT.	I	C	This panel of expert
Treatment with beta-blockers, verapamil or sodium channel blockers (class IC agents) is recommended in symptomatic patients with papillary muscle tachycardia.	I	C	This panel of experts
Treatment with beta-blockers, verapamil or sodium channel blockers (class IC agents) is recommended in symptomatic patients with mitral and tricuspid annular tachycardia.	I	C	This panel of experts

Catheter ablation under echo guidance by experienced operators after failure of <u>one or more sodium channel blockers</u> (class IC agents) or in patients refusing long-term anti-arrhythmic drug therapy should be considered in symptomatic patients with <u>papillary muscle tachycardia.</u>	IIa	B	576–578
Catheter ablation by experienced operators after failure of one or more sodium channel blockers (class IC agents) or in patients not wanting long-term anti-arrhythmic drug should be considered in symptomatic patients with <u>mitral and tricuspid annular tachycardia.</u>	IIa	B	534, 579–581

Patients without structural heart disease

Patients without structural heart disease

Catheter ablation of VT is recommended for patients with idiopathic VT

1. for monomorphic VT that is causing severe symptoms.
2. for monomorphic VT when antiarrhythmic drugs are not effective, not tolerated, or not desired.
3. for recurrent sustained polymorphic VT and VF (electrical storm) that is refractory to antiarrhythmic therapy when there is a suspected trigger that can be targeted for ablation.

VT catheter ablation is contra-indicated

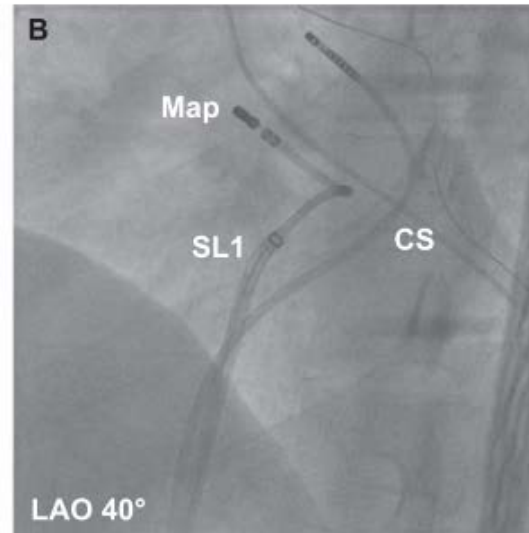
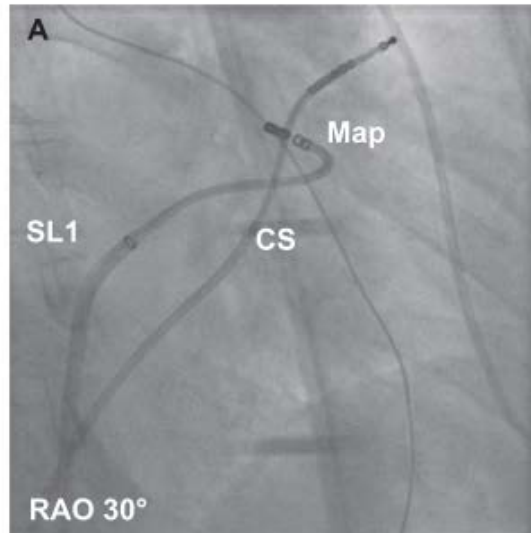
1. in the presence of a mobile ventricular thrombus (epicardial ablation may be considered);
 2. for asymptomatic PVCs and/or NSVT that are not suspected of causing or contributing to ventricular dysfunction;
 3. for VT due to transient, reversible causes, such as acute ischaemia, hyperkalaemia, or drug-induced torsade de pointes.
-

No structural heart disease

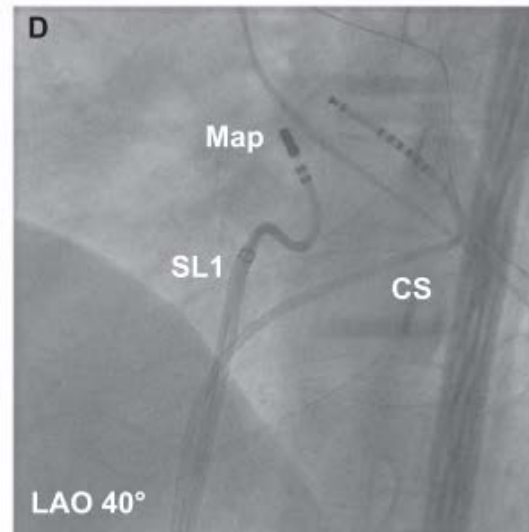
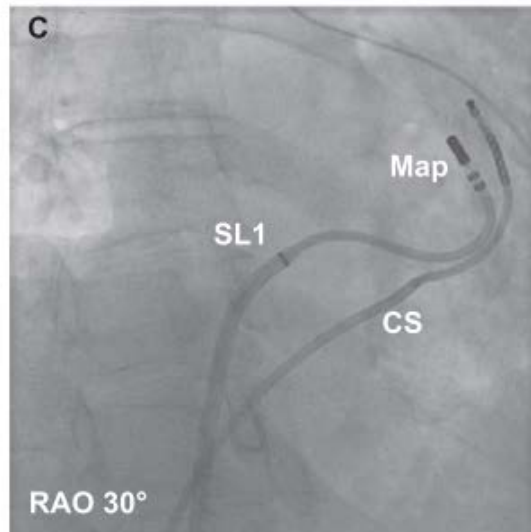
- Class I [ESC, HRS]
 - Symptomatic RVOT-VT or ILVT
 - Antiarrhythmic drugs are not effective
- Symptomatic, drug refractory LVOT/aortic cusp/epicardial VT or papillary muscle VT or mitral and tricuspid annular VT [Class IIa (ESC)]

Ventricular Arrhythmias Arising From the Left Ventricular Outflow Tract Below the Aortic Sinus Cusps

RCC



LCC



Sustained Polymorphic
VT/VF

Idiopathic VF

Treatment of idiopathic ventricular fibrillation

Recommendations	Class ^a	Level ^b	Ref. ^c
ICD implantation is recommended in survivors of idiopathic VF.	I	B	154, 583
<u>Catheter ablation of PVCs triggering recurrent VF leading to ICD interventions</u> is recommended when performed by experienced operators.	I	B	467, 584–587
Catheter ablation of PVCs leading to electrical storm is recommended when performed by experienced operators.	I	B	467, 584–587

Short-coupled TdP

Treatment of short-coupled torsade de pointes

Recommendations	Class ^a	Level ^b	Ref. ^c
ICD is recommended in patients with conclusive diagnosis of short-coupled TdP.	I	B	589
Intravenous verapamil to acutely suppress/prevent an electrical storm or recurrent ICD discharges should be considered.	IIa	B	590, 591
<u>Catheter ablation for long-term suppression/prevention of an electrical storm or recurrent ICD discharges</u> should be considered.	IIa	B	586

Brugada syndrome

Risk stratification and management in Brugada Syndrome

Catheter ablation may be considered in patients with a history of electrical storms or repeated appropriate ICD shocks.

IIb

C

201,
455

Sustained Polymorphic VT/VF

- Catheter ablation of VTs or a triggering focus of VF should be considered in patients with VT/VF storm when adequate experience is available. [IIa, Level C]
- In cases of recurrent polymorphic VT/VF in patients with the BrS, an epicardial substrate involving the RVOT may be amenable to catheter ablation.

Sustained Polymorphic VT/VF

- PVC triggering recurrent VF [Class I (ESC), Class IIa (HRS)]
- Class IIb [ESC, HRS]
 - recurrent polymorphic VT/VF in patients with the BrS

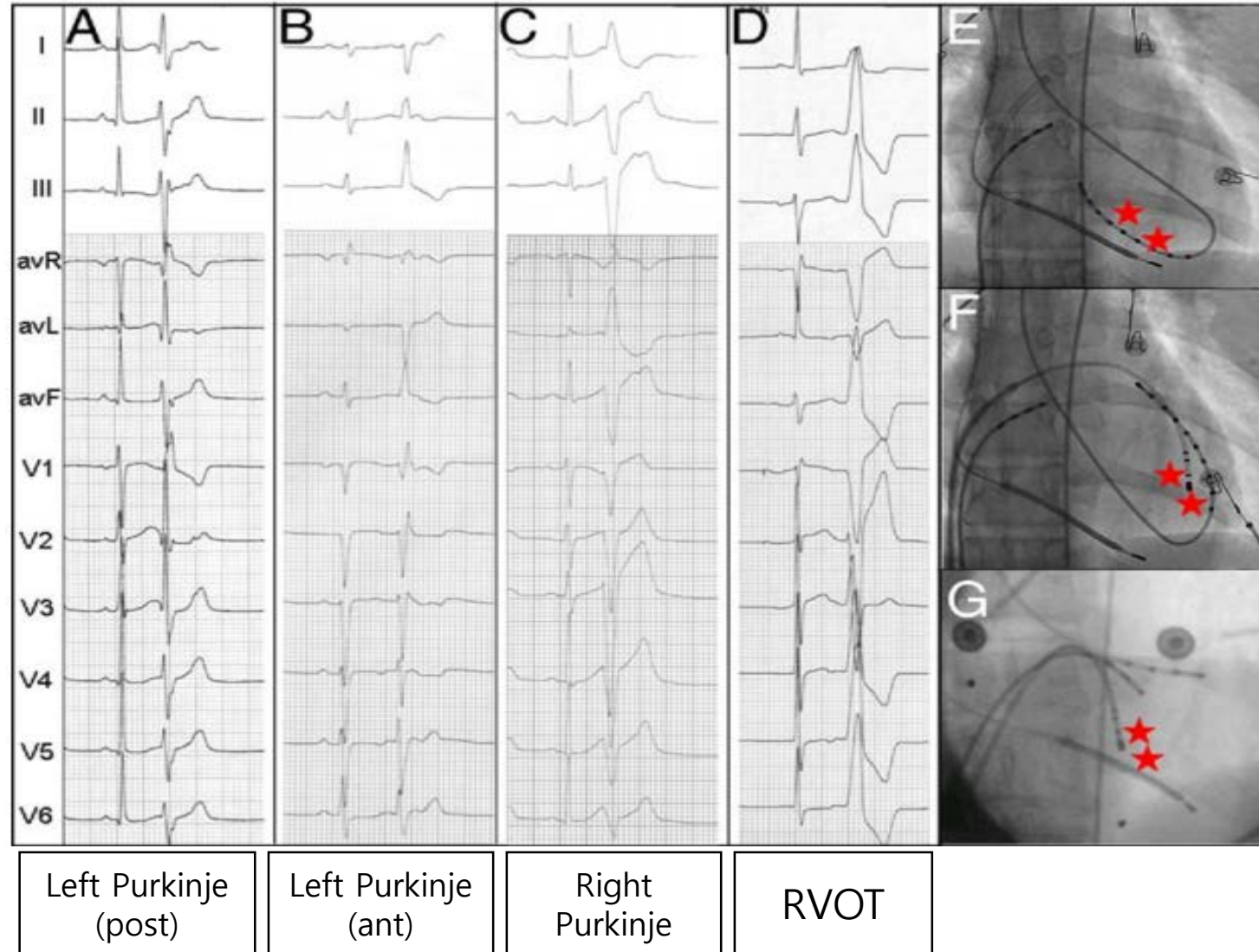
Long-Term Follow-Up of Idiopathic Ventricular Fibrillation Ablation

A Multicenter Study

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Bordeaux, Saint Pierre, Paris, Nancy, and Clermond-Ferrand, France; Yokohama, Japan; Bad Krozingen, Germany; Madrid, Spain; and Brussels, Belgium

Triggered VF



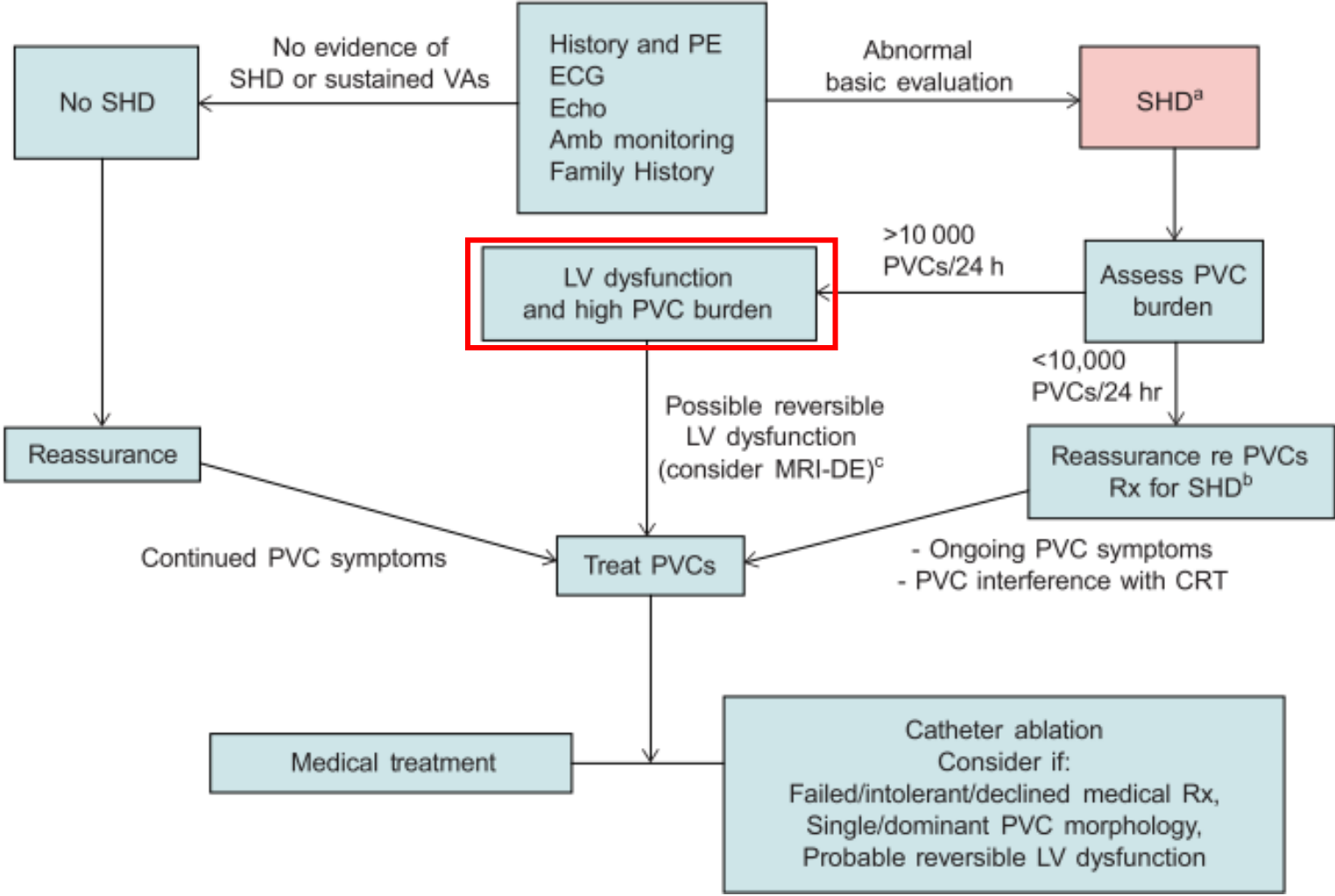
PVC/NSVT

PVC with LV dysfunction

Treatment of patients with left ventricular dysfunction and premature ventricular complex

Recommendations	Class ^a	Level ^b	Ref. ^c
In patients with frequent symptomatic PVC or NSVT:			
– Amiodarone should be considered.	IIa	B	64
– Catheter ablation should be considered.	IIa	B	341–343
Catheter ablation should be considered in patients with LV dysfunction associated with PVCs.	IIa	B	341–343

PVC



PVC

- Catheter ablation should be considered for patients with markedly symptomatic despite conservative treatment or for those with very frequent PVCs associated with a decline in LV systolic function.
- Catheter ablation may also be helpful when frequent PVCs interfere with cardiac resynchronization therapy.

PVC

- Class IIa [ESC, HRS]
 - Symptomatic, high PVC burden, LV dysfunction
- Frequent PVCs interfere with CRT [Class IIb (HRS)]

Electrocardiographic and electrophysiological characteristics of premature ventricular complexes associated with left ventricular dysfunction in patients without structural heart disease

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Aims

The mechanism responsible for premature ventricular complex (PVC)-mediated left ventricular (LV) dysfunction remains unclear. We sought to determine the electrocardiographic and electrophysiological characteristics of PVC-mediated LV dysfunction.

Methods and results

One hundred and twenty-seven patients who underwent radiofrequency catheter ablation (RFCA) for frequent PVCs (PVCs burden $\geq 10\%/24$ h) and had no significant structural heart disease were investigated. Left ventricular dysfunction (ejection fraction $< 50\%$) was present in 28 of 127 patients (22.0%). The mean PVC burden (31 ± 11 vs. $22 \pm 10\%$, $P < 0.001$), the presence of non-sustained ventricular tachycardia (53.6 vs. 33.3%, $P = 0.05$), and the presence of a retrograde P-wave following a PVC (64.3 vs. 30.3%, $P = 0.001$) were significantly greater in those with LV dysfunction than in those with normal LV function. The cut-off PVC burden related to LV dysfunction was 26%/day, with a sensitivity of 70% and a specificity of 78%. The PVC morphology, QRS axis, QRS width, coupling interval, the presence of interpolation, and PVC emergence pattern during exercise electrocardiogram were not significantly different between the two groups. The origin sites of PVCs, the acute success rate, and the recurrence rate during follow-up after RFCA were similar. In a multivariate analysis, the PVC burden (odds ratio 2.94, 95% confidence interval 0.90–3.19, $P = 0.006$) and the presence of retrograde P-waves (odds ratio 2.79, 95% confidence interval 1.08–7.19, $P = 0.034$) were independently associated with PVC-mediated LV dysfunction.

Conclusion

A higher PVC burden ($>26\%/day$) and the presence of retrograde P-waves were independently associated with PVC-mediated LV dysfunction.

Ventricular arrhythmias in congenital heart disease

Prevention of sudden cardiac death and management of ventricular arrhythmias in patients with congenital heart disease

Recommendations	Class ^a	Level ^b	Ref. ^c
After evaluation to define the cause of the event and exclude any reversible causes, ICD implantation is recommended for patients with CHD who are survivors of an aborted cardiac arrest.	I	B	488–491
ICD implantation is recommended for patients with CHD with symptomatic sustained VT who have undergone haemodynamic and electrophysiological evaluation.	I	B	488–492
Catheter ablation is recommended as additional therapy or an alternative to ICD in patients with CHD who have <u>recurrent monomorphic VT or appropriate ICD therapies that are not manageable by device reprogramming or drug therapy.</u>	I	C	492
ICD therapy is recommended in adults with CHD and a systemic LVEF <35%, biventricular physiology, symptomatic HF despite optimal medical treatment and NYHA functional class II or III.	I	C	493, 494

Catheter ablation should be considered as <u>an alternative to drug therapy for symptomatic sustained</u> monomorphic VT in patients with CHD and an ICD.	IIa	B	492
ICD therapy may be considered in patients with advanced single or systemic RV dysfunction in the presence of other risk factors such as non-sustained VT, NYHA functional class II or III or severe systemic AV valve regurgitation.	IIb	B	489, 497, 498
PVS may be considered for risk stratification of SCD in patients with tetralogy of Fallot who have one or more risk factors among LV dysfunction, non-sustained VT and QRS duration >180 ms.	IIb	B	496
PVS may be considered in patients with CHD and non-sustained VT to determine the risk of sustained VT.	IIb	C	This panel of experts
Surgical ablation guided by electrophysiological mapping may be considered in patients with CHD undergoing cardiac surgery, with clinical sustained VT and with inducible sustained monomorphic VT with an identified critical isthmus.	IIb	C	This panel of experts
Catheter ablation or prophylactic anti-arrhythmic therapy is not <u>recommended for asymptomatic infrequent PVC in patients with CHD and stable ventricular function.</u>	III	C	This panel of experts

Ventricular arrhythmias in congenital heart disease

- Catheter ablation may be appropriate for patients with CHD who have newly recognized or progressive ventricular dysfunction and a high burden of monomorphic ventricular ectopy. [IIb, Level C]

Congenital heart disease

- Drug refractory recurrent monomorphic VT [Class I (ESC)]
- Symptomatic monomorphic VT, alternative to drug therapy [IIa (ESC)]
- High PVC burden, LV dysfunction [Class IIb (HRS)]

Summary

- Sustained monomorphic VT with structural heart disease
 - Incessant, electrical storm, BBRT
 - Drug refractory recurrent
 - First episode
- Sustained monomorphic VT without structural heart disease
 - Symptomatic, drug refractory
 - RVOT, ILVT / LVOT, aortic cusp, papillary m., epicardial, annular
- Polymorphic VT/VF
 - PVC triggering VF
 - Recurrent polymorphic VT/VF in patients with the BrS
- PVC
 - Symptomatic, high PVC burden, LV dysfunction
 - Frequent PVC interfere with CRT

The role of VT ablation

- Prophylactic or Early ablation
 - Prevent recurrent ICD shocks
 - Side effect of antiarrhythmic agents
- Advances in ablation techniques (outcome vs complication)