



**ANTITHROMBOTIC MANAGEMENT OF
PATIENTS UNDERGOING
ELECTROPHYSIOLOGICAL PROCEDURES**

**ABLATION OF RIGHT SIDED
VENTRICULAR
TACHYCARDIAS**

**PAOLO DELLA BELLA
CATERINA BISCEGLIA**

San Raffaele Hospital
Milan, Italy



CONFLICTS OF INTEREST

Research grants:

Biosense Webster

St. Jude Medical

Biotronik

Boston Scientific

Fellowship support:

Biosense Webster

St. Jude Medical

Biotronik

Boston Scientific

Medtronic

Consultant fee:

St. Jude Medical

Consensus document on antithrombotic therapy in the setting of electrophysiological procedures

Blanc JJ, . Europace 2008;10:513-27.

Risk stratification

Low-risk procedures: right-side interventions (atrial tachycardias, kent bundle, and junctional and ventricular tachycardia) except those performed during atrial flutter

Recommendations for low-risk procedures

Right-sided procedures (except AFL) are at low risk of thrombo-embolism during and after the procedure. Conversely, the risk of bleeding seems to be higher with anticoagulation. Therefore, anticoagulation therapy is not necessary for right-sided procedures (before, during, and after the procedure) unless other risk factors for systemic embolism are present.

Table 1 Incidence of thrombotic or bleeding complications vs. type of anticoagulant therapy used after ablation in 3388 patients at low risk⁵⁰

Complications	Warfarin (n = 767)	Aspirin (n = 1437)	None (n = 1184)
Bleeding/ haematoma	0.52%	1.04%	0.42%
Thrombotic events*	0.26%	0.39%	0.08%

*Thrombotic events were considered: cerebral, deep vein thrombosis, and pulmonary.

NASPE prospective catheter ablation registry. Post-procedure anticoagulation was prescribed in 22%, aspirin in 42%, and no specific therapy in 35%. The incidence of TE or bleeding complications was generally low, and there were no significant differences among groups.

EHRA/HRS Expert Consensus on Catheter Ablation of Ventricular Arrhythmias

Developed in a partnership with the European Heart Rhythm Association (EHRA), a Registered Branch of the European Society of Cardiology (ESC), and the Heart Rhythm Society (HRS); in collaboration with the American College of Cardiology (ACC) and the American Heart Association (AHA)

Heart Rhythm, Vol 6, No 6, June 2009

Right heart procedures that do not involve placement of a catheter into the left ventricle or atrium

During the procedure, systemic anticoagulation with heparin is not necessary unless other factors are present that increase the risk for thromboembolic complications. Some laboratories routinely anticoagulate with heparin due to concern for deep venous thrombosis and pulmonary emboli. Anticoagulation during the procedure may be considered, particularly for long procedures, when multiple venous catheters or when extensive ablation is required. Anticoagulation is warranted for patients with a history of prior venous thromboemboli, and/or who have known risk factors for thrombosis (e.g. Factor V Leiden) or have right to left intracardiac shunts that pose a risk of paradoxical embolism. Following the procedure, long-term anticoagulation is not required. Some centres administer aspirin 75–325 mg daily for 3–12 weeks.

Anticoagulation

Intravascular insertion and manipulation of catheters, creation of ablation lesions, activation of coagulation factors, and potential disruption of atherosclerotic plaques contribute to a risk of thromboembolism during and after catheter ablation.^{176,177} The risk likely varies with the type and site of ablation, and patient factors that influence the tendency for thromboembolism. Patients with structural heart disease

Antithrombotic management in patients undergoing electrophysiological procedures: a European Heart Rhythm Association (EHRA) position document endorsed by the ESC Working Group Thrombosis, Heart Rhythm Society (HRS), and Asia Pacific Heart Rhythm Society (APHRS)

Sticherling C.,. Europace 2015.

Antithrombotic management in patients undergoing right ventricular catheter ablation: consensus recommendations

In patients with structural heart disease undergoing endocardial ablation of a right ventricular tachycardia only, established therapy with a VKA, a NOAC, or platelet inhibitors can be continued. Unfractionated heparin should be considered during the procedure. Before an epicardial ablation, it can be useful to stop NOACs 48 h before the procedure. Before an epicardial ablation, it may be considered to withhold VKA until the INR is < 1.5.

Overall, right-sided procedures are at low risk for relevant thromboembolic events. Heparin use seems not to be necessary for right-sided procedures and deliver no clinical benefit, but might be given in special situations (long-lasting procedure, history of previous venous thromboemboli, and/or known risk factors for thrombosis) or in the presence of right to left intracardiac shunts that pose a risk of paradoxical emboli.⁶⁸ Meticulous sheath management with frequent flushing is required during the procedure, and compression after pulling the sheath should be done with care and only as long as necessary. Should patients require oral anticoagulation or platelet inhibition for another reason, there is no evidence mandating discontinuation of these agents before the RV ablation procedure.

In patients on a VKA and a higher risk for thromboembolism, it is safe to continue oral anticoagulation at an INR between 2 and 3.^{29,69,70} Studies addressing the NOACs in this context are not available, but it seems reasonable to manage patients with stopping the NOAC the evening before the day of intervention and continue if no bleeding complications occurred 3–4 h after the intervention.⁷¹

For planned epicardial access, an oral anticoagulation with a VKA should be withdrawn to achieve an INR of < 1.5 and NOACs should be discontinued for at least 48 h (longer for renal impairment, if dabigatran is used). There is no proven benefit of administering post-interventional aspirin or oral anticoagulation unless it is required for another reason.

Right-sided VA catheter ablation: complication rates

	N pts	Site	Acute Success rate	F.U.	Reported complications
Zhang F, <i>Heart rhythm 2013</i>	136	RVOT –non contact mapping system	86.8%	36.2±17.5 months	3 pts cardiac tamponade (surgical repair in 2)
Della Bella P, <i>Europace, 2014</i>	141	RVOT (91), LVOT (50) – Non contact mapping system	89%	Mean/range : 2.1 / 1.5-2.7 years	1 cardiac tamponade (pericardial drainage)
Philips B, <i>Heart Rhythm 2015</i>	30 ARVC	12 pts (40%) endo-epi 18 pts (60%) epi	97%	19.7 ± 11.7 months	1 pericarditis
Marchlinski FE, <i>Circulation 2004</i>	21 (19 RFCA)	15 pts:RV endo 4 pts: LV endo	74%	27±22 months	-
Garcia FE, <i>Circulation 2009</i>	13	13 pts RV endo-epi	85%	18.3±12.7 months	-

NO thrombotic complications reported.
Is it a matter of underdetection?

EVOLVING CONCEPTS....

- ⦿ Are there factors predisposing to thrombus formation?
 - Patient-related?
 - Procedure-related?

EVOLVING CONCEPTS...

- ⦿ Are there factors predisposing to thrombus formation?
 - Patient-related?
 - Procedure-related?

Intracardiac Thrombosis in Patients with Arrhythmogenic Right Ventricular Cardiomyopathy

Wu L, J Cardiovasc Electrophysiol, December 2014

TABLE 1
Clinical Characteristics of the Study Cohort (n = 193)

Age, years	38 (8-80)
Sex, M/F	144/49
Syncopal/pre-syncopal, n (%)	93 (48.2%)
Median RA dimension, [†] (mm)	45 (32-61)
Mean RV dimension, [‡] (mm)	51 (35-69)
TFC	
[†] Epsilon wave, n (%)	30 (15.5%)
Prolonged TAD, n (%)	59 (30.6%)
Negative T waves, n (%)	114 (59.1%)
V ₁ -V ₃ or beyond	90 (46.6%)
V ₁ -V ₄ or beyond with complete RBBB	13 (6.7%)
V ₁ -V ₂	8 (4.1%)
V ₄ -V ₆	3 (1.6%)
LBBB VT with superior axis, n (%)	166 (86.0%)
PVCs > 500/24h, n (%)	41 (21.2%)
Structural major TFC, n (%)	91 (47.2%)
Structural minor TFC, n (%)	61 (31.6%)
Family history, n (%)	21 (10.9%)

	With (n = 8)	Without (n = 185)	P value
Age, years	41 (18-71)	38 (8-80)	0.554
Sex, M/F	3/5	141/44	0.014
Syncopal/pre-syncopal, n (%)	3 (62.5%)	90 (53.0%)	0.491
Mean CHA ₂ DS ₂ -VASC score	2 (1-3)	0 (0-3)	0.001
RA dilatation, n (%)	7 (87.5%)	99 (53.5%)	0.042
RV dilatation, n (%)	8 (100.0%)	144 (77.8%)	0.134
LA dimension, (mm)	31 (27-39)	31 (18-56)	0.811
LV dimension, (mm)	44.5 (34-56)	43.0 (33-70)	0.378
LVEF (%)	39.5 (20.7-6)	61 (20.7-5)	<0.001
RV aneurysm, n (%)	1 (12.5%)	28 (15.1%)	0.838
Atrial fibrillation/flutter, n (%)	2 (25%)	18 (9.7%)	0.195
Hypertension, n (%)	3 (37.5%)	12 (6.5%)	0.001
Diabetes mellitus, n (%)	0 (0.0%)	4 (2.2%)	1.000
Epsilon wave	1 (12.5%)	29 (15.7%)	1.000
Prolonged TAD	3 (37.5%)	56 (30.3%)	0.702
Negative T waves	5 (62.5%)	109 (58.9%)	1.000
Family history	1 (12.5%)	20 (10.8%)	1.000

-Ten intracardiac thrombi were identified in 8 patients (4.1%), the majority (7/10) of which were found in the right ventricular apex

-Female gender and left ventricular dysfunction were independently associated with increased risk for thrombosis in ARVC

-During a median FU of 38 months (range 2-128), no thromboembolism event or sudden death was observed in OAC-group; 1 pt with definite PTE and 1 SD due to suspected pulmonary thromboembolism in no-OAC.

OSR EXPERIENCE

VT ABLATION IN THE SETTING OF STRUCTURAL HEART DISEASE

JAN 2010-SEPT 2015

- ◎ 860 procedures/683 pts
- ◎ 67 ARVC patients

- ◎ 1 pt (ARVC) with RV thrombus prior to CA (18 mm)
 - Significant RV dilation/dysfunction (RV EF 30%)
 - RV free-wall bulging/apical aneurysm

 - IV heparin (aPTT 50-70 sec)
 - After 7 days: thrombus resolution
 - No procedure-related complications
 - Oral anticoagulation for 3 months after CA

EVOLVING CONCEPTS...

- ⦿ Are there factors predisposing to thrombus formation?
 - Patient-related?
 - Procedure-related?

EVOLVING CONCEPTS....

- ⦿ Are there factors predisposing to thrombus formation?
 - Substrate based ablation
 - Extensive ablation
 - Hypokinetic wall
 - Multiple long-sheaths
 - Multi-electrode catheters
 - Anecdotal reports of thrombus formation after bipolar ablation