EVIDENZE E NUOVE PROSPETTIVE
NEL TRATTAMENTO DELLE
PATOLOGIE TROMBOEMBOLICHE

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Gestione dei farmaci anticoagulanti nei pazienti sottoposti a terapia di ablazione transcatetere

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Conflict of interest disclosure

Dr. De Ponti has received :

-lecture fees by Biosense Webster and Biotronik

-educational grants from Medtronic, Biotronik, Boston Scientific, Abbott, Biosense Webster

Classificazione delle aritmie

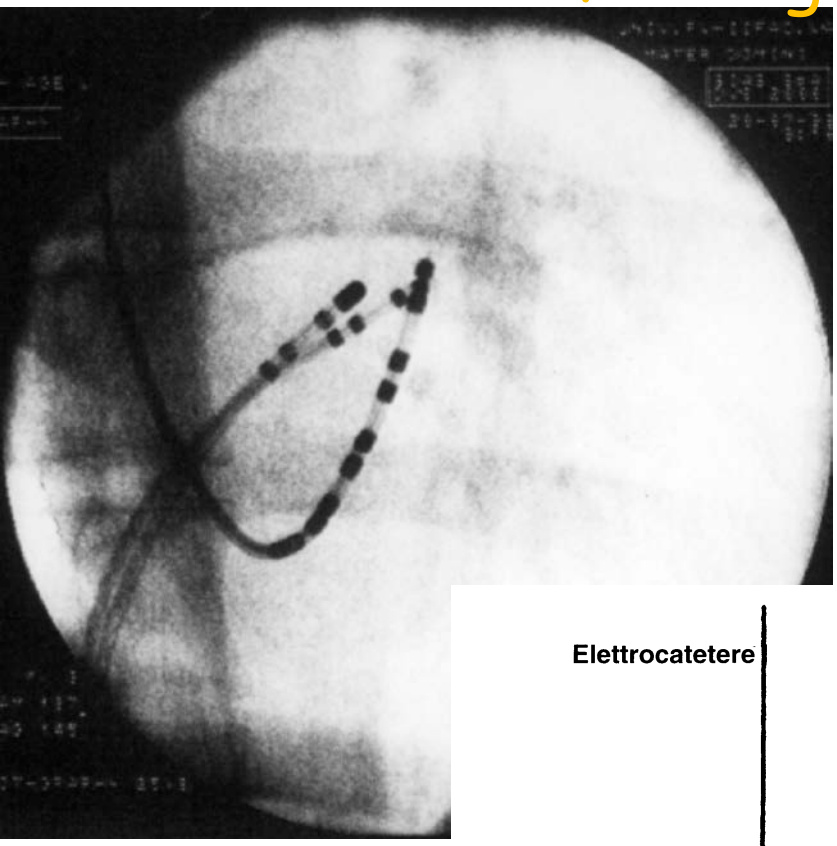
TABELLA I – *Classificazione delle aritmie*

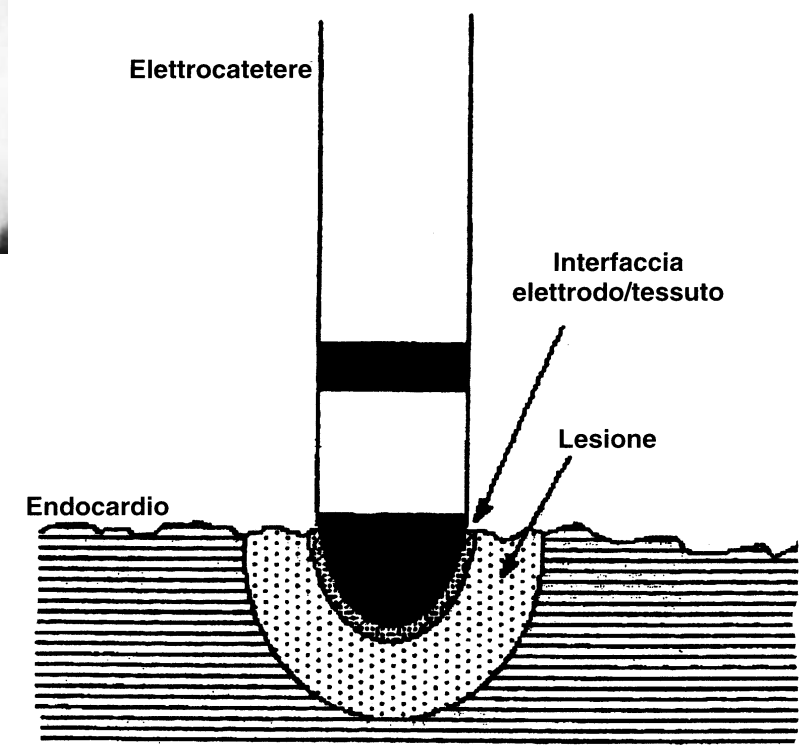
Tachicardie sopraventricolari	Tachicardie ventricolari	Bradicardie	Battiti prematuri
Tachicardia sinusale (TS)	*Tachicardia ventricolare (TV) • Tachicardia ventricolare sostenuta monomorfa (TVS) *• Forme particolari – TV da rientro branca-branca (TVRBB) – TV infundibulare (TVI) – TV fascicolare (TVF) – TV polimorfa (TVP) – Torsione di punta (TdP)	Bradicardia sinusale	*Battiti prematuri sopraventricolari • Atriali (BPA) • Giunzionali (BPG)
*Tachicardia atriale (TA)		Blocchi seno-atriali (BSA)	
*Flutter atriale (Fl.A) • Tipico • Atipico		Blocchi A-V (BAV) • I grado • II grado – Wencheback – Mobitz 2 – 2/1 – Avanzato • III grado	*Battiti prematuri ventricolari (BPV)
*Fibrillazione atriale (FA) • Parossistica • Persistente • Permanente	*Fibrillazione ventricolare Ritmo idioventricolare accelerato (RIVA)		
*Tachicardia da rientro nel nodo A-V (TR-NAV) • "Slow-fast" • "Fast-slow" • "Slow-slow"		Aritmia sinusale (AS)	
*Tachicardia da rientro A-V (TRAV) • Da via accessoria manifesta (WPW) ortodromica • Da via accessoria manifesta (WPW) antidromica • Da via accessoria occulta • Da via accessoria a conduzione lenta (tipo Coumel) • Da fibre atrio-fascicolari o nodo-fascicolari (tipo Mahaim)		Dissociazione A-V	
Tachicardia automatica giunzionale (TAG)			

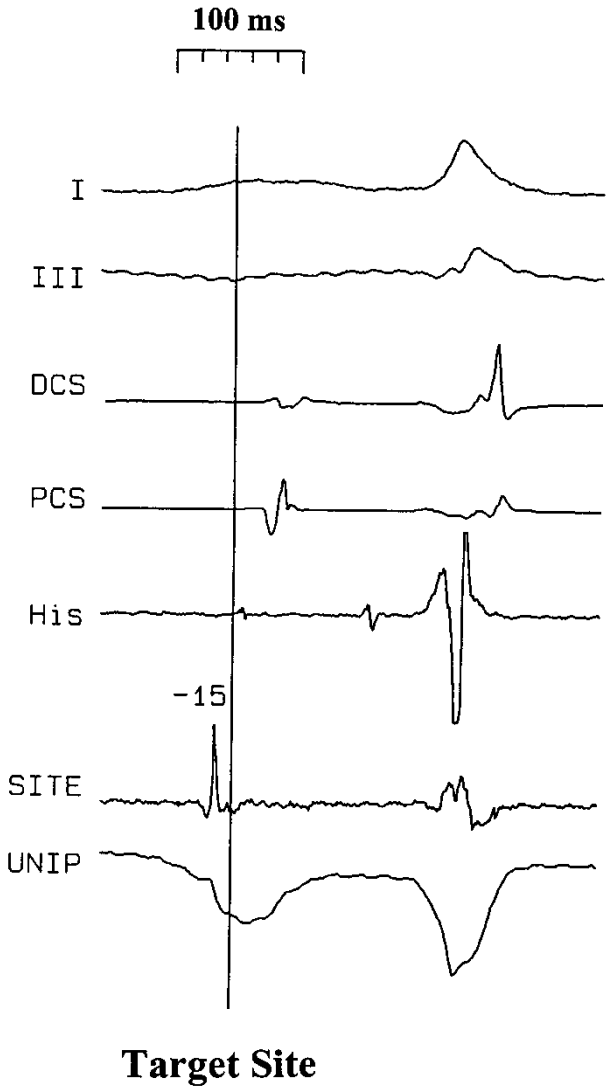
* possibile eseguire ablazione transcatetere

G Ital Cardiol 1999; 29: 805-809

Studio elettrofisiologico ed ablazione trascatetere







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* Tachicardia atriale (TA)	• Tachicardia ventricolare sostenuta monomorfa (TVS)	Blocchi seno-atriali (BSA)	• Atriali (BPA) • Giunzionali (BPG)
* Flutter atriale (Fl.A)	* • Forme particolari	Blocchi A-V (BAV)	* Battiti prematuri ventricolari (BPV)
• Tipico	– TV da rientro branca-branca (TVRBB)	• I grado	
• Atipico	– TV infundibulare (TVI)	• II grado	
* Fibrillazione atriale (FA)	– TV fascicolare (TVF)	– Wenchebach	
• Parossistica	– TV polimorfa (TVP)	– Mobitz 2	
• Persistente	– Torsione di punta (TdP)	– 2/1	
• Permanente	* Fibrillazione ventricolare	– Avanzato	
	Ritmo idioventricolare accelerato (RIVA)	• III grado	
* Tachicardia da rientro nel nodo A-V (TR-NAV)		Aritmia sinusale (AS)	
• "Slow-fast"			
• "Fast-slow"		Dissociazione A-V	
• "Slow-slow"			
* Tachicardia da rientro A-V (TRAV)			
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• Da via accessoria occulta			
• Da via accessoria a conduzione lenta (tipo Coumel)			
• Da fibre atrio-fascicolari o nodo-fascicolari (tipo Mahaim)			
Tachicardia automatica giunzionale (TAG)			

ablazione estesa

possibile cateterismo sinistro

* possibile eseguire ablazione transcatetere

G Ital Cardiol 1999; 29: 805-809

Antithrombotic management in patients undergoing electrophysiological procedures

Antithrombotic management in patients undergoing right atrial ablation procedures (excluding atrial flutter): consensus recommendation

Unfractionated heparin should be considered during the procedure.

It is not recommended to start the patients on oral anticoagulation or aspirin unless otherwise indicated.

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.

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Antithrombotic management in patients undergoing electrophysiological procedures

Antithrombotic management in patients undergoing focal left atrial ablation of an accessory pathway or a focal atrial tachycardia: consensus recommendations

During the ablation procedure, it is recommended to give unfractionated heparin with a target ACT of >300 s.

After focal left atrial ablation of an accessory pathway or an AT, oral anticoagulation or the use of aspirin is not recommended unless otherwise indicated.

Antithrombotic management in patients undergoing ablation procedures for left ventricular tachycardia: consensus recommendations

It is recommended to give unfractionated heparin with a target ACT of >300 s during the procedure.

It can be useful not to interrupt oral anticoagulation with a VKA before ablation of a left VT.

It is recommended to stop oral anticoagulation with a NOAC at least 24 h before LV ablation (longer for dabigatran, if renal impairment is present).

A transthoracic echocardiography can be useful to rule out LV thrombi before the ablation procedure.

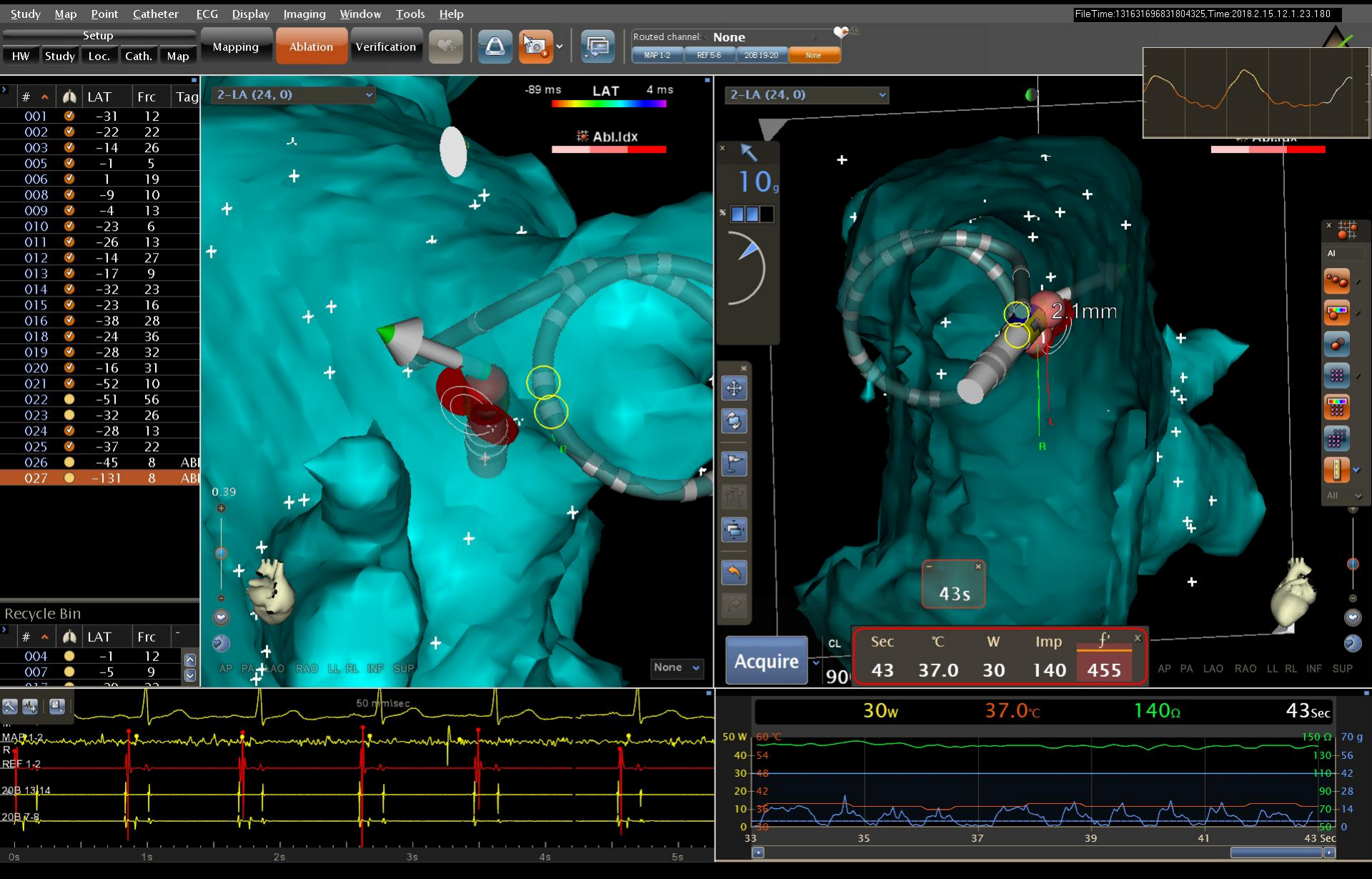
When switching to an epicardial access during a LV ablation, it may be considered to administer protamine before epicardial access.

After LV ablation, oral anticoagulation or aspirin for 4–12 weeks may be considered.

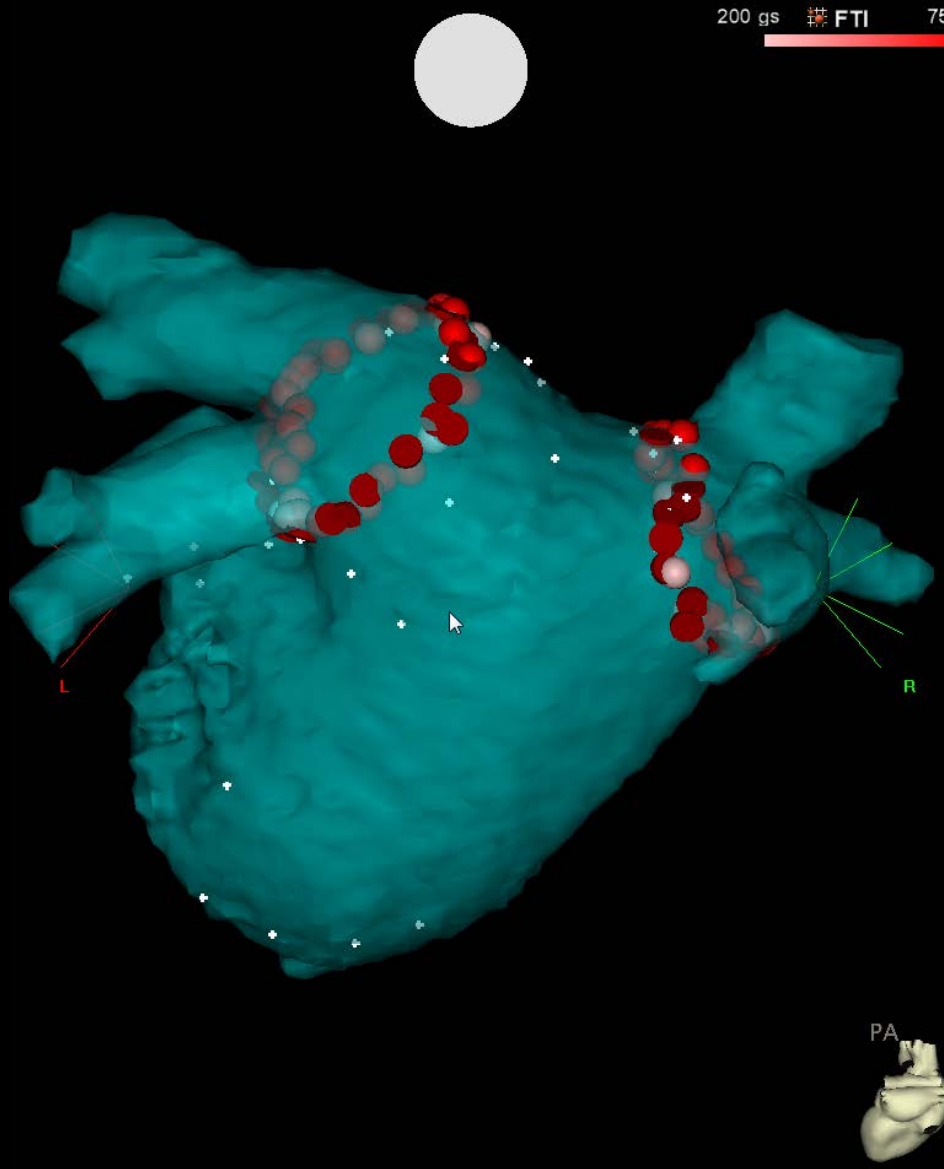
In the absence of another indication, oral anticoagulation before LV ablation should not be given.

Sticherling et al. Europace 2015

Ablazione treanscatetere di FA con isolamento elettrico delle vene polmonari - 1



Ablazione treanscatetere di FA con isolamento elettrico delle vene polmonari - 2



Rischio tromboembolico ed emorragico legato anche:
-strumentazione AS
-creazione di lesioni
-doppia anticoagulazione intraprocedurale

Periprocedure thromboembolic and bleeding complication in pts undergoing AF ablation in the last decade

Author	Year	Journal	TE complication %	Overall Bleeding %
Arbelo E	2017	Eur Heart J	0.4	2.5
Pothineni NVK	2014	Int J Cardiol.	RCT 1.17 DB 0.7	RCT 2.13 DB 4.38
Stabile G	2014	Europace	0.3	3.05
Deshmukh A	2013	Circulation	1.02	3.05
Aldhoon B	2013	Europace	0.42	2.6
Bertaglia E	2013	JCE	0.34	2.8
Gupta A	2013	Circ A & E	0.6	3.3
Shah RU	2012	J Am Coll Cardiol	0.3	5.1
Piccini JP	2012	Circulation	0.8	2.2
Cappato R	2010	Circ A & E	0.94	2.8
Ellis DJ	2009	Circulation	0.6	8.3
Calkins H	2009	Circ A & E	0.7	2.4

European registry on catheter ablation of atrial fibrillation

Table 1 Baseline clinical characteristics

	All (n =3593)	Paroxysmal AFib (n =2428)	Persistent AFib (n = 985)	Long-standing persistent AFib (n = 180)
Age (years)				
n	3592	2428	985	179
Median (IQR)	59.0 (52.0–65.0)	59.0 (52.0–65.0)	60.0 (53.0–66.0)	57.0 (49.0–63.0)
Females (%)	1146/3593 (31.9%)	846/2428 (34.8%)	257/985 (26.1%)	43/180 (23.9%)
Caucasian (%)	3111/3429 (90.7%)	2136/2344 (91.1%)	843/928 (90.8%)	132/157 (84.1%)
Body mass index >30 kg/m^2 (%)	1047/3333 (31.4%)	659/2239 (29.4%)	327/927 (35.3%)	61/167 (36.5%)
Cardiovascular risk factors (%)				
Diabetes mellitus	347/3583 (9.7%)	219/2422 (9.0%)	104/981 (10.6%)	24/180 (13.3%)
Hypertension	1954/3579 (54.6%)	1268/2417 (52.5%)	580/983 (59.0%)	106/179 (59.2%)
Active smokers	353/3432 (10.3%)	226/2320 (9.7%)	96/936 (10.3%)	31/176 (17.6%)
Former smokers (>1 year)	653/3432 (19.0%)	426/2320 (18.4%)	200/936 (21.4%)	27/176 (15.3%)
Hypercholesterolemia	1159/3517 (33.0%)	799/2375 (33.6%)	314/966 (32.5%)	46/176 (26.1%)
Ischaemic thromboembolic events (%)	230/3576 (6.4%)	148/2421 (6.1%)	73/975 (7.5%)	9/180 (5.0%)
Implanted devices				
PM	116/3590 (3.2%)	76/2425 (3.1%)	38/985 (3.9%)	2/180 (1.1%)
ICD	27/3588 (0.8%)	17/2424 (0.7%)	8/984 (0.8%)	2/180 (1.1%)
CRT-P	5/3588 (0.1%)	4/2424 (0.2%)	1/984 (0.1%)	0/180
CRT-D	7/3588 (0.2%)	4/2424 (0.2%)	3/984 (0.3%)	0/180
CHA2DS2-VASc				
0	805/3476 (23.2%)	573/2342 (24.5%)	197/964 (20.4%)	35/170 (20.6%)
1	1038/3476 (29.9%)	704/2342 (30.1%)	285/964 (29.6%)	49/170 (28.8%)
2	810/3476 (23.3%)	541/2342 (23.1%)	227/964 (23.5%)	42/170 (24.7%)
3	525/3476 (15.1%)	331/2342 (14.1%)	168/964 (17.4%)	26/170 (15.3%)
4	197/3476 (5.7%)	128/2342 (5.5%)	58/964 (6.0%)	11/170 (6.5%)
5	70/3476 (2.0%)	47/2342 (2.0%)	18/964 (1.9%)	5/170 (2.9%)
6	24/3476 (0.7%)	13/2342 (0.6%)	9/964 (0.9%)	2/170 (1.2%)
7	7/3476 (0.2%)	5/2342 (0.2%)	2/964 (0.2%)	0/170

Arbelo et al. Eur Heart J 2017

2017 HRS/EHRA/ECAS/APHRS/SOLAECE expert consensus statement on catheter and surgical ablation of atrial fibrillation

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Table 4 Anticoagulation strategies: pre-, during, and postcatheter ablation of AF

	Recommendation	Class	LOE	References
Preablation	For patients undergoing AF catheter ablation who have been therapeutically anticoagulated with warfarin or dabigatran, performance of the ablation procedure without interruption of warfarin or dabigatran is recommended.	I	A	400,532,829,830,833,834,837,841
	For patients undergoing AF catheter ablation who have been therapeutically anticoagulated with rivaroxaban, performance of the ablation procedure without interruption of rivaroxaban is recommended.	I	B-R	842
	For patients undergoing AF catheter ablation who have been therapeutically anticoagulated with a NOAC other than dabigatran or rivaroxaban, performance of the ablation procedure without withholding a NOAC dose is reasonable.	IIa	B-NR	1395
	Anticoagulation guidelines that pertain to cardioversion of AF should be adhered to in patients who present for an AF catheter ablation procedure.	I	B-NR	5,6
	For patients anticoagulated with a NOAC prior to AF catheter ablation, it is reasonable to hold one to two doses of the NOAC prior to AF ablation with reinitiation postablation.	IIa	B-NR	835–840
	Performance of a TEE in patients who are in AF on presentation for AF catheter ablation and who have been receiving anticoagulation therapeutically for 3 weeks or longer is reasonable.	IIa	C-EO	5,6
	Performance of a TEE in patients who present for ablation in sinus rhythm and who have not been anticoagulated prior to catheter ablation is reasonable.	IIa	C-EO	5,6
	Use of intracardiac echocardiography to screen for atrial thrombi in patients who cannot undergo TEE may be considered.	IIb	C-EO	768,820–824

Calkins et al. Europace 2018

During ablation	Heparin should be administered prior to or immediately following transseptal puncture during AF catheter ablation procedures and adjusted to achieve and maintain an ACT of at least 300 seconds.	I	B-NR	768,802–804,820,830,840,846–849
	Administration of protamine following AF catheter ablation to reverse heparin is reasonable.	IIa	B-NR	851
Postablation	In patients who are not therapeutically anticoagulated prior to catheter ablation of AF and in whom warfarin will be used for anticoagulation postablation, low molecular weight heparin or intravenous heparin should be used as a bridge for initiation of systemic anticoagulation with warfarin following AF ablation.*	I	C-EO	
	Systemic anticoagulation with warfarin* or a NOAC is recommended for at least 2 months postcatheter ablation of AF.	I	C-EO	1,2
	Adherence to AF anticoagulation guidelines is recommended for patients who have undergone an AF ablation procedure, regardless of the apparent success or failure of the procedure.	I	C-EO	5,6
	Decisions regarding continuation of systemic anticoagulation more than 2 months post ablation should be based on the patient's stroke risk profile and not on the perceived success or failure of the ablation procedure.	I	C-EO	5,6
	In patients who have not been anticoagulated prior to catheter ablation of AF or in whom anticoagulation with a NOAC or warfarin has been interrupted prior to ablation, administration of a NOAC 3 to 5 hours after achievement of hemostasis is reasonable postablation.	IIa	C-EO	835–840
	Patients in whom discontinuation of anticoagulation is being considered based on patient values and preferences should consider undergoing continuous or frequent ECG monitoring to screen for AF recurrence.	IIb	C-EO	

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Periprocedural Stroke and Bleeding Complications in Patients Undergoing Catheter Ablation of Atrial Fibrillation With Different Anticoagulation Management

Results From the Role of Coumadin in Preventing Thromboembolism in Atrial Fibrillation (AF) Patients Undergoing Catheter Ablation (COMPARE) Randomized Trial

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Background—Periprocedural thromboembolic and hemorrhagic events are worrisome complications of catheter ablation for atrial fibrillation (AF). The periprocedural anticoagulation management could play a role in the incidence of these complications. Although ablation procedures performed without warfarin discontinuation seem to be associated with lower thromboembolic risk, no randomized study exists.

Methods and Results—This was a prospective, open-label, randomized, parallel-group, multicenter study assessing the role of continuous warfarin therapy in preventing periprocedural thromboembolic and hemorrhagic events after radiofrequency catheter ablation. Patients with $CHADS_2$ score ≥1 were included. Patients were randomly assigned in a 1:1 ratio to the off-warfarin or on-warfarin arm. The incidence of thromboembolic events in the 48 hours after ablation was the primary end point of the study. The study enrolled 1584 patients: 790 assigned to discontinue warfarin (group 1) and 794 assigned to continuous warfarin (group 2). No statistical difference in baseline characteristics was observed. There were 39 thromboembolic events (3.7% strokes [n=29] and 1.3% transient ischemic attacks [n=10]) in group 1: two events (0.87%) in patients with paroxysmal AF, 4 (2.3%) in patients with persistent AF, and 33 (8.5%) in patients with long-standing persistent AF. Only 2 strokes (0.25%) in patients with long-standing persistent AF were observed in group 2 ($P<0.001$). Warfarin discontinuation emerged as a strong predictor of periprocedural thromboembolism (odds ratio, 13; 95% confidence interval, 3.1–55.6; $P<0.001$).

Conclusion—This is the first randomized study showing that performing catheter ablation of AF without warfarin discontinuation reduces the occurrence of periprocedural stroke and minor bleeding complications compared with bridging with low-molecular-weight heparin.

Clinical Trial Registration—URL: http://www.clinicaltrials.gov. Unique identifier: NCT01006876.

(***Circulation***. **2014;129:2638-2644.**)

Periprocedural stroke and bleeding complications in patients undergoing AF ablation on and off warfarin

Table 2. Thromboembolic Events According to AF Type

	Group 1 (Off Warfarin; n=790), n (%)	Group 2 (On Warfarin; n=794), n (%)	*P* Value
Stroke/TIA combined	39 (4.9)	2 (0.25)	<0.001
Paroxysmal	2 (0.87)	0 (0.0)	0.25
Persistent	4 (2.3)	0 (0.0)	0.06
LSP	33 (8.5)	2 (0.49)	<0.001
Stroke	29 (3.7)	2 (0.25)	<0.001
Paroxysmal	1 (0.44)	0 (0.0)	0.47
Persistent	2 (1.15)	0 (0.0)	0.25
LSP AF	26 (6.7)	2 (0.49)	<0.001
TIA	10 (1.27)	0 (0.0)	<0.001
Paroxysmal	1 (0.44)	0 (0.0)	1.00
Persistent	2 (1.15)	0 (0.0)	0.50
LSP	7 (1.81)	0 (0.0)	0.016

AF indicates atrial fibrillation; LSP, long-standing persistent; and TIA, transient ischemic attack.

Table 4. Pericardial Effusion Management

	Off Coumadin, n=7	On Coumadin, n=4
Patients with pericardial effusion requiring pericardiocentesis, n (%)	7 (100)	4 (100)
Requiring surgery, n (%)	1 (14.3)	0 (0)
Requiring fresh-frozen plasma or transfusion, n (%)	2 (28.6)	4 (100)
Mean pericardial fluid aspiration, cm^3	750±300	950±300
Mean protamine for reversal, mg	65±8	85±12*

*Significant difference between groups ($P<0.05$).

Di Biase et al. Circulation 2014

Use of NOACs

Table 4 Interpretation of coagulation assays in patients treated with different NOACs and range of values at trough (P5–P95) in patients with normal function and the standard dose, as measured in clinical trials

	Dabigatran	Apixaban	Edoxaban	Rivaroxaban
Plasma peak level	2 h after ingestion	1–4 h after ingestion	1–2 h after ingestion	2–4 h after ingestion
Plasma trough level	12 h after ingestion	12 h after ingestion	24 h after ingestion[36]	24 h after ingestion
PT	Cannot be used	Can be prolonged but no known relation with bleeding risk[37]	Prolonged but variable and no known relation with bleeding risk[36,38] Range at trough: NA	Prolonged but no known relation with bleeding risk Range at trough: 12–26 s with Neoplastin Plus as reagent; local calibration required
INR	Cannot be used	Cannot be used	Cannot be used	Cannot be used
aPTT	Range (P10–P90) at trough D150: 40.3–76.4 s Range (P10–P90) at trough D110: 37.5–60.9 s At trough: >2× ULN may be associated with excess bleeding risk[39]	Cannot be used	Prolonged but no known relation with bleeding risk[36]	Cannot be used
dTT	No data from RE-LY trial on range of values At trough: >200 ng/mL ≥65 s: may be associated with excess bleeding risk[39,40]	Cannot be used	Cannot be used[41]	Cannot be used
Anti-FXa chromogenic assays	Not applicable	Quantitative; no data on threshold values for bleeding or thrombosis Range at trough: 1.4–4.8 IU/mL	Quantitative[41]; no data on threshold values for bleeding or thrombosis Range at trough: 0.05–3.57 IU/mL[a]	Quantitative; no data on threshold values for bleeding or thrombosis Range at trough: 6–239 μg/L
ECT	Range (P10–P90) at trough D150: 44.3–103 Range (P10–P90) at trough D110: 40.4–84.6 At trough: ≥3× ULN: excess bleeding risk[39]	Not affected[37]	Not affected	Not affected
ACT	Rather flat dose response. No investigation on its use. Limited utility	No data. Cannot be used	No data. Cannot be used	Minor effect. Cannot be used

Routine monitoring is not required. Assays need cautious interpretation for clinical use in special circumstances, as discussed in the text.
PT, prothrombin time; aPTT, activated partial thromboplastin time; dTT, diluted thrombin time; ECT, ecarin clotting time; INR, international normalized ratio; ACT: activated clotting time; ULN, upper limit of normal.
[a](P2.5–P97.5) for edoxaban.

Heidbuchel Europace 2015

Use of NOACs

Table 7 Estimated drug half lives and effect on AUC NOAC plasma concentrations in different stages of CKD compared to healthy controls

	Dabigatran	Apixaban	Edoxaban	Rivaroxaban
CrCl >80 mL/min	12–17 h[61]	12 h	10–14 h[51,65]	5–9 h (young) 11–13 h (elderly)
CrCl 50–80 mL/min CKD Stages I and II	~17 h[122] (+50%)	~14.6 h[123] (+16%)	~8.6 h[124] (+32%)[SmPC]	~8.7 h[125] (+44%)[126]
CrCl 30–50 mL/min CKD Stage III	~19 h[122] (+320%)	~17.6 h (+29%)	~9.4 h[124] (+74%)[SmPC]	~9.0 h (+52%)[126]
CrCl 15–30 mL/min CKD Stage IV	~28 h[122] (+530%)	~17.3 h (+44%)	~16.9 h[124] (72%)[SmPC]	~9.5 h (+64%)[126]
CrCl ≤ 15 mL/min CKD Stage V; off-dialysis	No data	– (+36%)	– (+93%)[SmPC]	– (+70%)[127]

CKD, chronic kidney disease; CrCl, creatinine clearance.

Heidbuchel Europace 2015

Use of NOACs in patients undergoing AF ablation

- Randomized and observational studies
- Comparable safety and efficacy as uninterrupted warfarin
- Increasingly used in clinical practice
- Quick onset and offset of anticoagulation
- Heterogeneous periprocedural management
- Lack of studies comparing different NOACs or strategies

Systematic review and meta-analysis to evaluate perioperative strategies with NOACs

- uninterrupted (no discontinuation of NOACs)
- mildly interrupted (<12 hours before PVI)
- interrupted (≥ 12 hours before PVI).

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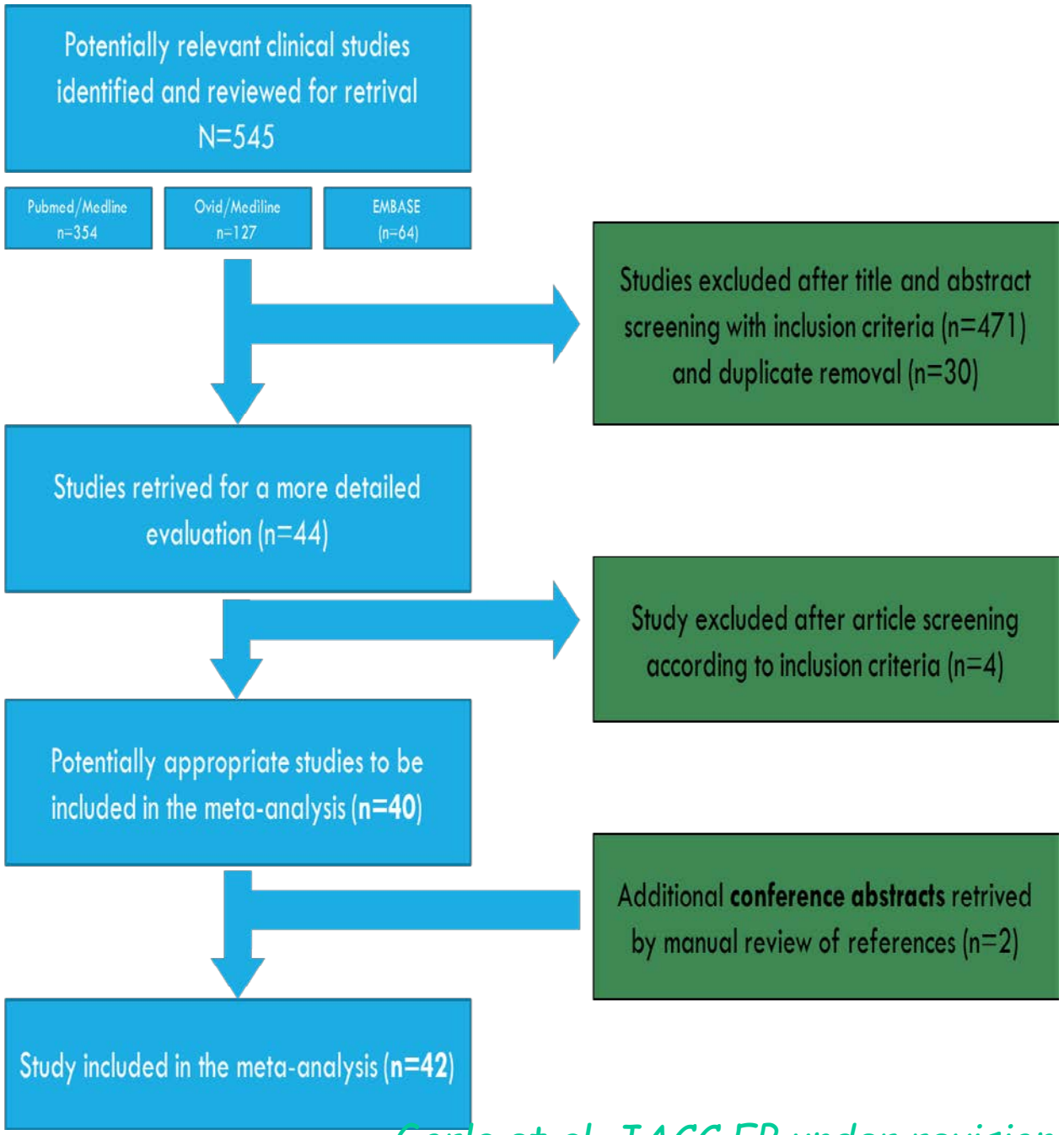
Study selection



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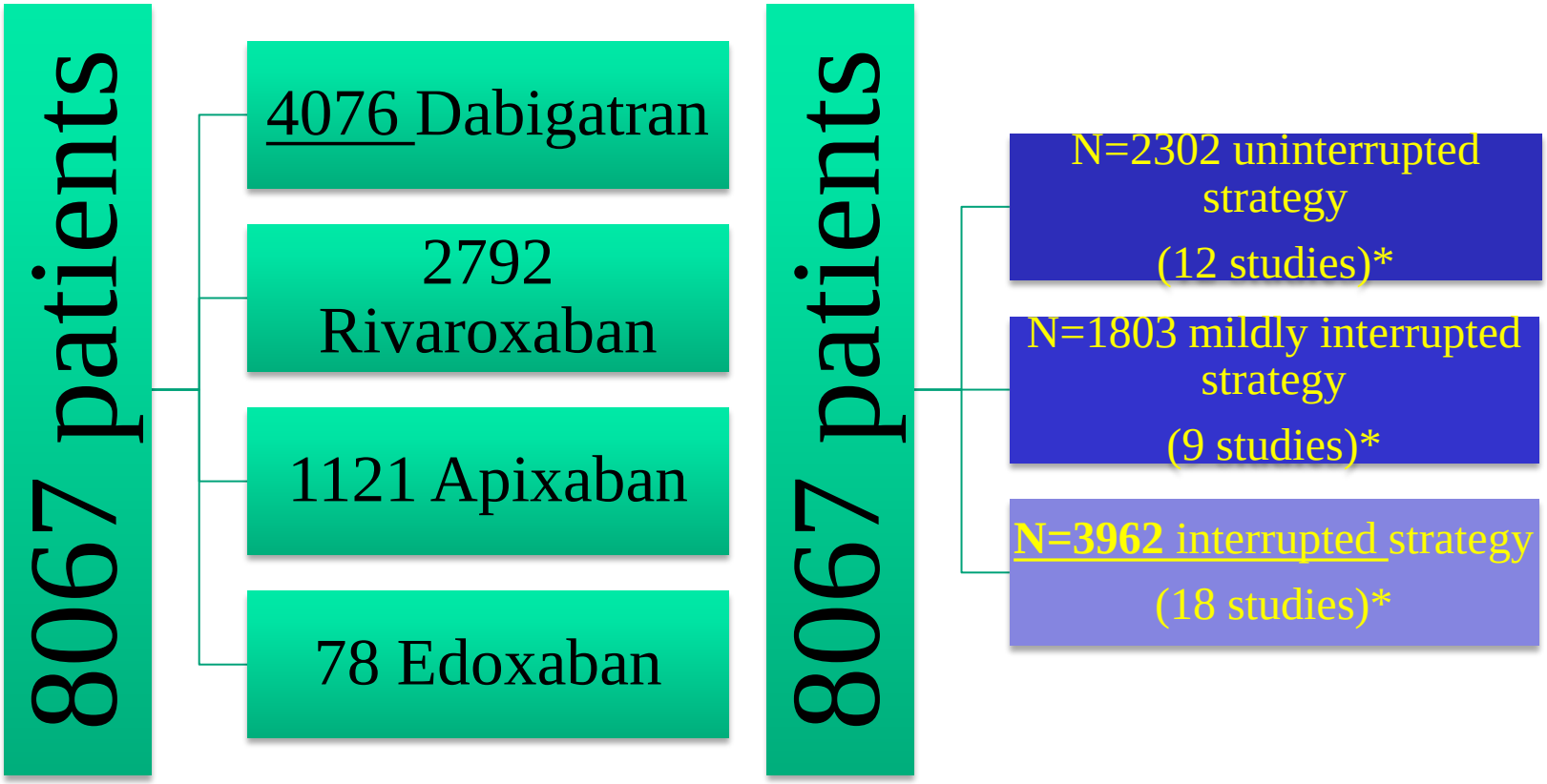
Meta-analysis: results-1



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Results-2: TH complications

	Overall % (95%CI)	Uninterrupted % (95%CI)	Mildly interrupted % (95%CI)	Interrupted % (95%CI)
Dabigatran	0.47 (0.28-0.72)	0.12 (0.00-0.46)	0.62 (0.27-1.13)	0.63 (0.30-1.08)
Rivaroxaban	0.41 (0.18-0.71)	0.20 (0.01-0.63)	0.38 (0.00-1.51)	0.58 (0.23-1.07)
Apixaban	0.25 (0.03-0.67)	0.18 (0.00-0.65)	0.37 (0.00-1.46)	1.11 (0.16-6.21)
Edoxaban	2.12 (0.13-6.39)	n.a.	0.00 (0-22.92)	1.64 (0.09-9.98)
All NOACs	**0.35 (0.23 - 0.49)**	0.14 (0.02-0.33)	0.43 (0.18-0.78)	0.49 (0.29-0.73)

no heterogeneity among the studies (I_2= 0) *Gorla et al. JACC EP under revision*

Results-3: major bleeding complications

Major Bleeding	Overall % (95%CI)	Uninterrupted % (95%CI)	Mildly interrupted % (95%CI)	Interrupted % (95%CI)
Dabigatran	1.24 (0.73-1.88)	1.33 (0.62-2.21)	1.23 (0.23-2.99)	1.32 (0.76-2.03)
Rivaroxaban	1.06 (0.68-1.51)	0.49 (0.12-1.08)	1.67 (0.47-3.59)	1.41 (0.83-2.14)
Apixaban	1.23 (0.63-2.02)	1.38 (0.64-2.40)	1.05 (0.08-3.11)	1.11 (0.16-6.21)
Edoxaban	3.38 (0.54-8.51).	n.a.	5.88 (0.31-30.76)	1.64 0.09-9.98)
All NOACs	**1.12 * (0.83 – 1.44)**	0.99 (0.63-1.43)	1.44 * (0.49-2.86)	1.17 (0.86-1.53)

*Substantial heterogeneity among the studies

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Results-4: overall bleeding complications

	Overall % (95%CI)	Uninterrupted % (95%CI)	Mildly interrupted % (95%CI)	Interrupted % (95%CI)
Dabigatran	6.60 (4.18-9.53)	7.65 (2.33-15.67)	8.75 (4.81-13.74)	4.38 (1.87-7.87)
Rivaroxaban	6.00 (4.01-8.36)	6.08 (2.44-11.20)	9.46 (3.95-17.03)	4.68 (3.03-6.67)
Apixaban	5.16 (3.43-7.21)	5.09 (2.79-8.03)	6.79 (3.79-10.59)	1.11 (0.16-6.21)
Edoxaban	6.14 (1.97-12.41)	n.a.	5.88 (0.31-30.76)	4.92 (1.28-14.6)
All NOACs	**5.07** * (3.82-6.49)	5.05 * (3.15-7.36)	8.27 * (5.16-12.86)	3.53 * (2.11-5.29)

*Substantial heterogeneity among the studies

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Increased dose of unfractionated heparin to reach and maintain target ACT value

- Observed both when NOACs are uninterrupted or interrupted
- Observed both with the direct thrombin inhibitor and factor Xa inhibitors
- The mechanism is currently unknown
- However, the prevalence of the clinical outcomes for every strategy is within the previously reported rates and this is reassuring

Effect of pre-procedural interrupted apixaban on heparin anticoagulation during AF ablation

Uninterrupted warfarin likely facilitates achieving target ACTs, with potential mechanisms including direct prolongation of the ACT, suppression of vitamin K-dependent prothrombin, and a neutral effect on antithrombin, preserving its availability to inhibit thrombin [9]. The exact mechanisms by which apixaban and dabigatran are associated with increased intraprocedural heparin requirements and lower levels of heparin anticoagulation as measured by the ACT are unknown. Interruption of the oral anticoagulant prior to catheter ablation in the case of apixaban and dabigatran may play a role. However, several recent studies, though reporting unadjusted data with more limited analyses of heparin dosing and ACTs, showed higher heparin administration and lower ACTs with *uninterrupted* apixaban in CA of AF in comparison to uninterrupted warfarin [13–15]. A direct negative effect of dabigatran has been suggested as a possible explanation for the observed difficulties of achieving target ACTs through downregulation of antithrombin, a substrate for heparin to exert its anticoagulant effect [8, 13]. There may be unidentified direct effect(s) of apixaban as well. Additionally, apixaban-treated patients have shown a diminished response to heparin compared to dabigatran possibly due to the fact that apixaban inhibits factor Xa activity, which heparin also uses to exert its action [13].

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Considerazioni conclusive - 1

- L'utilizzo dei farmaci anticoagulanti nel periodo periprocedurale dell'ablazione transcatetere dipende dal tipo di procedura e dalla sede del substrato
- La FA è l'aritmia cardiaca più frequente e pertanto il trattamento di ablazione viene sempre più utilizzato; il trattamento anticoagulante deve essere particolarmente attento

Considerazioni conclusive - 2

- Per questa procedura, vi sono dati che mostrano che la terapia continuativa con warfarin associato ad eparina intraprocedurale con ACT>300 ha percentuale di tromboembolia e sanguinamento accettabile
- Tutti i NOACs sono una valida e sempre più utlizzata alternativa al warfarin e la loro farmacocinetica consente una maggiore flessibilità di utilizzo