



AperTO - Archivio Istituzionale Open Access dell'Università di Torino

Reproducibility of pulmonary vein isolation guided by the ablation index: 1-year outcome of the AIR registry

This is the author's manuscript	
Original Citation:	
Availability:	
This version is available http://hdl.handle.net/2318/1769838	since 2021-01-28T15:09:31Z
Published version:	
DOI:10 1111/ice 14531	
Terms of use:	
Open Access	
Anyone can freely access the full text of works made available as "Open Access". Works made available under a Creative Commons license can be used according to the terms and conditions of said license. Use of all other works requires consent of the right holder (author or publisher) if not exempted from copyright protection by the applicable law.	

(Article begins on next page)

Reproducibility of Pulmonary Vein Isolation Guided by the Ablation Index: one year outcome of the AIR registry.

Stabile G, MD,^{a,b,c} Lepillier A, MD,^d De Ruvo E, MD,^e Scaglione M, MD,^f Anselmino M,
MD,^g Sebag FA, MD,^h Pecora D, MD,ⁱ Gallagher MM, MD,¹ Rillo M, MD,^m Viola G, MD,ⁿ Rossi L, MD,^o De Santis V, MD,^p Landolina M, MD,^q Castro A, MD,^r Grimaldi M, MD,^s Badenco N, MD,^t Del Greco M, MD,^u De Simone A, MD,^b Pisanò E,MD,^k Abbey S,MD,¹ Lamberti F,MD,^m Pani A,MD,ⁿ Zucchelli G,MD,^o Sgarito G,MD,^p Bertaglia E, MD,^v StrisciuglioT, MD,^a Solimene F, MD,^a.

^aClinica Montevergine, Mercogliano (AV), Italy; ^bClinica San Michele, Maddaloni (CE); ^cAnthea Hospital, Bari; ^dCentre Cardiologique du Nord, St Denis, Paris, France; ^ePoliclinico Casilino, Roma, Italy; ^fOspedale Cardinal Massaia, Asti, Italy; ^gDepartment of Medical Sciences, A.O.U. Citta della Salute e della Scienza di Torino, University of Turin Italy;

- ¹⁵ ^hInstitut Mutualiste Montsouris, Paris, France; ⁱFondazione Poliambulanza, Brescia, Italy; ^lSt George's Hospital, London, United Kingdom; ^mCasa di Cura Villa Verde, Taranto, Italy; ⁿOspedale San Francesco, Nuoro, Italy; ^oOspedale Civili Guglielmo da Saliceto, Piacenza, Italy; ^pIstituto Clinico Sant'Ambrogio, Milano, Italy; ^qOspedale Maggiore di Crema, Italy; ^rOspedale Pertini, Roma, Italy; ^sOspedale Regionale Miulli, Acquaviva delle Fonti (BA),
- 20 Italy; ^tCentre La Pitiè Salpetriere, Paris, France; ^uOspedale S Maria Del Carmine, Rovereto (TN), Italy; ^kOspedale Vito Fazzi, Lecce, Italy; ¹Hôpital Privé Du Confluent (HPCN), Nantes, France; ^mOspedale Sant'Eugenio, Roma, Italy; ⁿOspedale di Lecco, Italy; ^oAzienda Ospedaliera Pisana, Pisa, Italy; ^pA.R.N.A.S. Civico Cristina Benfratelli, Palermo; ^vDepartment of Cardiac, Thoracic, and Vascular Sciences, University of Padova, Italy.

25

10

30

Corresponding Author: Dr Giuseppe Stabile, Clinica San Michele, via Montella 16, 81024 Maddaloni (CE), Italy, Tel.+393488960534; e-mail: gmrstabile@tin.it

35

Conflicts of interest

MA, is consultant for Biosense Webster and has received educational grants from Abbott.

ABSTRACT

Aim. This prospective, multi-center study was designed to evaluate the reproducibility of PV isolation guided by the ablation index (AI).

Methods. A total of 490 consecutive patients with paroxysmal (80.4%) and persistent AF

- 50 underwent first time PV encircling and were divided in four study groups according to operator's preference in choosing the ablation catheter (a contact force (ST) or contact force surround flow (STSF) catheter) and the AI setting (330-450 or 380-500 at posterior and anterior walls, respectively). Radiofrequency energy was delivered targeting interlesion distance ≤ 6 mm.
- 55 Results. At 12 months follow-up a high rate of freedom from AF recurrences was observed in patients with both paroxysmal and persistent AF (91% vs 83.3%, p=0.039). There was no difference in the rate of atrial arrhythmias recurrence among the four study groups (4.5% in Group ST330-450, 12.2% in Group ST 380-500, 14.9% in Group STSF330-450, 9.4% in Group STSF380-500, p=0.083). Recurrence was also similar between patients treated with a
- 50 ST (8.0%) or STSF catheter (12.1%, p=0.2), within patients targeting an AI settings of 330-450 (10.9%) or 380-500 (10.3%, p=0.64), and among operators (p=0.84 and p=0.75 in patients with paroxysmal and persistent AF, respectively).

Conclusions. An ablation protocol respecting strict criteria for contiguity and quality lesion resulted in high rate of one-year freedom from AF recurrence, both in patients with

paroxysmal and persistent AF, irrespective of the ablation catheters, AI settings, and operator.Key words: atrial fibrillation, catheter ablation, ablation index, reproducibility.

CONDENSED ABSTRACT

75 In 490 consecutive patients with AF, undergoing first time PV encircling, an ablation protocol respecting strict criteria for contiguity and quality lesion resulted in high rate of oneyear freedom from AF recurrence, both in patients with paroxysmal and persistent AF, irrespective of the ablation catheter, AI setting, and operator.

What's New

	•	This is the first multicenter study to demonstrate the high reproducibility of one-year
		outcome of AF radiofrequency catheter ablation using an ablation protocol respecting
		strict criteria for contiguity and quality lesion.
	•	The high rate of one-year freedom from AF recurrence was observed both in patients
125		with paroxysmal and persistent AF
	•	The ablation catheters and the AI settings, chosen by the different operators, did not
		impact the one-year freedom from AF.
130		
135		
140		
145		
145		
150		

155

INTRODUCTION

- 160 Catheter ablation is a well-established treatment option for patients with symptomatic atrial fibrillation (AF) and is more successful at maintaining stable sinus rhythm than antiarrhythmic drugs. Pulmonary vein (PV) isolation is the cornerstone of catheter ablation in patients with both paroxysmal and persistent drug-refractory AF. The high rate of arrhythmias recurrence, mainly related to PV reconnection, and the wide outcome variability
- among several operators still remain the main limitations of AF catheter ablation (1-3).
 Recently, several technological improvements have been introduced to improve the efficiency of PV isolation. Among them, the Ablation Index (AI) (Biosense-Webster, Diamond Bar, California), a new marker of radiofrequency lesion quality, allowed a high rate of first pass pulmonary vein (PV) isolation (4-8) and a high single-procedure arrhythmia-free
- 170 survival at 1 year (4-7). The aim of this prospective, multi-center study, is to evaluate the reproducibility and outcome of PV isolation guided by the AI.

METHODS

- The Ablation Index Registry (AIR) (ClinicalTrials.gov Identifier: NCT03277976) is a
 prospective, multi-center, research study designed to evaluate the acute achievement of PV isolation with ThermoCool SmartTouch (ST) (Biosense-Webster, Diamond Bar, California) or ThermoCool SmartTouch surround flow SF (STSF) (Biosense-Webster, Diamond Bar, California) catheter using the AI Module. Enrollment started in November 2017 and ended in July 2018. The study was approved by local Ethics Committees and complied with the
- 180 Declaration of Helsinki guidelines. Written informed consent was obtained from all patients. Study population and study protocol. Enrollment criteria and ablation protocol has been already described (8). Briefly, we enrolled patients with paroxysmal or persistent atrial fibrillation (AF) who underwent their first AF ablation. Each operator performed AF catheter

ablation using its own ablation technique as concerning the ablation catheter (ST or STSF)

185 and the AI setting (380 posterior-500 anterior and 330 posterior-450 anterior). No randomization was required nor was there any deviation from the clinical practice of each center and operator. Therefore the enrolled population was divided in 4 groups: Group ST 330-450, Group ST 380-500, Group STSF 330-450, and Group STSF 380-500.

Ablation protocol. The ablation procedure has been already described (8). Briefly, the

- 190 ablation was usually performed under effective oral anticoagulation, and antiarrhythmic drugs were usually withdrawn before scheduled procedure. Ablation was carried out under conscious sedation or general anesthesia according to operators' preference. One or two transeptal accesses to the left atrium were achieved using a standard approach. Then, a duodecapolar circular mapping LASSO (Biosense-Webster, Diamond Bar, California)
- 195 catheter and the ablation catheter (ST or STSF) were placed in the left atrium. Left atrium mapping was performed in sinus rhythm. Patients with AF at the beginning of the index procedure underwent electrical cardioversion. After left atrium reconstruction the effective PV-left atrium electrical connection was checked by LASSO catheter. Radiofrequency pulses were delivered using the 3.5-mm Thermocool ST or STSF Catheter in power control mode.
- 200 Radiofrequency power was set between 20 and 35 W depending on different left atrial sites and the catheter tip was irrigated by saline at a flow rate of 2 mL/min during mapping and of 8 mL/min (STSF) or 17 mL/min (ST) and 15 mL/min (STSF) or 30 mL/min (ST) for outputs of less than and greater than 30 W, respectively (9). Radiofrequency energy was delivered to produce a circumferential ablation around the proximal part of each PV's ostium or around
- ipsilateral PVs according to the patient's anatomy or operator's preference. The lesion around the PV ostium was created by sequential point-by-point application of radiofrequency energy. Real-time automated display of RF applications (Carto VISITAGTM Module, Biosense Webster) was used with predefined settings of respiration adjustment, catheter stability (3)

mm for 3 s), minimum contact force (3 g over minimum 25% of time), with the lesion tag

- 210 display size of 3 mm, and AI thresholds: 450 for anterior wall and 330 for posterior wall, or 500 for anterior wall and 380 for posterior wall. In case of dislocation, a new RF application reaching the AI target was applied. Maximal inter tag distance between 2 neighboring Visitag was $\leq 6 \text{ mm}(4,10)$. Upon completion of circumferential ablation a circular mapping LASSO catheter was used to confirm PV isolation (first-pass isolation). In the absence of isolation
- 215 after completing the circle, LASSO guided touch-up ablation was delivered until PV isolation was achieved. Resumption of left atrium to PV conduction was evaluated at 30 minutes after ablation. In case of reconnection PVs were newly isolated targeting the points of electrical breakthrough.

All patients underwent a post-procedural ECG. Post-procedure echocardiography or other imaging was at the operators' discretion.

Post-ablation management and follow-up. Oral anticoagulation was continued the same day of the procedure for all patients and administered for at least 3 months or with no time limit in patients with a CHA2DS2-VASC score \geq 2. Patients with paroxysmal AF were discharged without antiarrhythmic drugs. Patients with persistent AF were discharged with or without antiarrhythmic drugs according to clinician's preference. Patients were scheduled for follow-up examinations 1,3,6, and 12 months after the initial treatment, and the clinical assessment of AF recurrence during the follow-up visits was performed by ECG and 24-hour

Holter monitoring.

220

225

Ablation was deemed successful in the absence of symptomatic or asymptomatic atrial

230 tachyarrhythmias lasting more than 30 seconds identified on surface ECG or on 24-hour Holter monitoring, off antiarrhythmic drug therapy. In patients with persistent AF we considered the ablation successful in absence of symptomatic or asymptomatic atrial tachyarrhythmias regardless of antiarrhythmic drug therapy used. As early relapse of atrial

tachyarrhythmias within the first 3 months after RF ablation may be a transient phenomenon,

this transition period was excluded from the final analysis (11).

Statistical analysis. Continuous variables are expressed as mean ± standard deviation or median and interquartile range according to their distribution. Normality of data distribution was tested with Shapiro-Wilk test. Categorical variables are expressed as absolute number with percentage (%). Comparison among groups for continuous variables was performed by

240 the unpaired Student T test or Mann-Whitney U test. Comparison of categorical variables among groups was performed by Chi square test. The rate of freedom from any atrial tachiarrhythmias was assessed by using the Kaplan-Meier curve. Statistical significance was set at a 2-tailed probability level of <0.05. All statistical analyses were performed using SPSS software (Version 24.0, IBM, Armonk, NY, US).

245

RESULTS

Study population. A total of 490 patients were enrolled: 96 patients in ST 330-450 Group, 81 in ST 380-500 Group, 162 in STSF 330-450 Group, and 151 in STSF 380-500 Group. The clinical characteristics of the study population have been already reported (8). Briefly, the

- 250 mean age was 59±11 years, 71% of patients were males, the mean body mass index was 27.1±4.2, the mean left atrium volume was 104±49 ml, the mean left ventricle ejection fraction was 58±8, 394 (80.4%) patients had paroxysmal AF, 36.8% had hypertension, 6.3% had diabetes mellitus. The left atrium volume was significantly higher in Group ST 380-500, the left ventricle ejection fraction was significantly lower in Group ST 330-450. No other
- 255 statistically significant difference was observed among the clinical characteristics of the four study groups.

Procedural data. The mean procedural time was 127±64 min, with a mean fluoroscopy time of 400±404 s, and a mean radiofrequency time of 31.9±11.8 min. The rate of first-pass PV

isolation was 90±16%. Resumption of left atrium to PV conduction 30 minutes after ablation

- was observed in 5.6% of PVs. The rate of first-pass PV isolation was similar among the four study groups, whereas procedure (ST330 129±44 min, ST380 144±44 min, STSF330 120±72 min, STSF380 125±73 min, p<0.001) and fluoroscopy time (ST330 542±285 s, ST380 540±416 s, STSF330 257±356 s, STSF380 379±454 s, p<0.001) significantly differed (8). A complication (4 pericardial effusions, 2 transient phrenic nerve palsy, 1 cardiac tamponade, 1
- 265 pneumonia) was observed in 8 (1,6%) patients without any difference among the four study groups (p=0.55).

One year outcome. One year follow-up was available in 453/490 (92.5%) patients. At 12 months follow-up a high rate of freedom from AF recurrences was observed in patients with both paroxysmal (91%) and persistent (83.3%, p=0.039) AF (Figure 1). There was no

- 270 difference in the rate of atrial arrhythmias recurrence among the four study groups (4.5% in Group ST330-450, 12.2% in Group ST 380-500, 14.9% in Group STSF330-450, 9.4% in Group STSF380-500, p=0.083) (Figue 2). At 12 months follow-up the rate of atrial arrhythmias recurrence was also similar between patients treated with a ST (8%) and STSF catheter (12.1%, p=0.2) (Figue 3), between patients targeting an AI setting of 330-450
- (10.9%) or 380-500 (10.3%, p=0.64) (Figure 4), and among operators (p=0.84 and p=0.75, respectively, in patients with paroxysmal and persistent AF).

DISCUSSION

The present study demonstrates that an ablation protocol, respecting strict criteria for 280 contiguity and quality lesion, resulted in high rate of one-year freedom from AF recurrence, both in patients with paroxysmal and persistent AF. The results were reproducible among different operators, and were not impacted by the ablation catheters and AI settings chosen.

PV isolation is considered the cornerstone of AF ablation in both paroxysmal and persistent AF. Despite the high acute success rate, achieving durable PV isolation has proven

- challenging. The high rate (up to 86%) of delayed recovery (12) in PV conduction has translated into disappointing single-procedure success rates (13). Recently a new radiofrequency lesion marker has demonstrated to improve the efficiency of PV isolation. De Pooter et al (14) studied 45 patients undergoing repeat ablation for AF recurrence after first AI guided PV isolation procedure. They found that the likelihood of finding 4 isolated PV at the time of repeat ablation for AF is 62%, higher than previously reported (15), concluding
- that PV reconnection is no longer the rule in patients with AF recurrence. This finding might justify the favourable acute and 1-year outcome after a PV isolation strategy based on stable, contiguous, and optimized radiofrequency applications by means of AI (4-7). However all these studies were single center and, overall, enrolled 475 patients. In our multicentre study
- we confirm these findings observing about 90% rate of freedom from AF recurrence.
 Moreover we reported a high (> 80%) one year success rate also in patients with persistent
 AF. Our findings were not impacted by the catheter (ST or STSF) chosen nor above all by the
 AI setting.

There is still a debate on the best AI values that allow effective, safe and durable PV

- 300 isolation. Das et al (16) studied the relationship between the AI and PV reconnection at repeat electrophysiology study. From receiver operating characteristic (ROC) curve analysis, optimal cutoff points (Youden Index) were calculated. For AI, the optimal cutoff for anterior/roof segments was 376 (sensitivity 63.6%, specificity 77.8%, and positive predictive value 97.2%) and for posterior/inferior segments was 340 (sensitivity 52.9%, specificity
- 305 94.3%, and positive predictive value 98.2%). No late reconnection was seen in anterior/roof segments where the minimum AI value was \geq 480 or in posterior/inferior segments where the

minimum AI value was \geq 370. El Haddad et al (17) studied acute and late PV reconnection.

By ROC curve analysis they found the highest (90%) specificity to predict durable PV isolation with an AI >550 on the anterior wall and >417 on the posterior wall. We have no

- data on late PV reconnection, however we did not observe any difference in one year
 outcome between an AI setting using higher (380-500) or lower (330-450) values. Our
 findings, might be justified by Ullah et al (15) series. They showed that ablation beyond 430
 AI provides minimal additional biophysical efficacy, suggesting an upper limit to use for
 clinical ablation.
- 315 Reproducibility of AF catheter ablation still remains an unsolved issue (1). Radiofrequency ablation, the current most used energy source in most countries (3), of AF is a technically complex procedure, with a long-learning curve, and its results seem to largely depend on Centre's experience. In recent years, cryoballoon ablation of AF has been introduced as an alternative 'single-shot' approach for PV isolation. Several multicenter studies (18,19)
- 320 showed the higher reproducibility of cryoballoon ablation compared with standard radiofrequency ablation as regards mid-term outcomes of catheter ablation of AF, with lower inter-operator and inter-centre variability. We (8) have already demonstrated that AI guided PV isolation allows comparable rate of acute PV isolation among operator with different skill performing ablation with different catheters, AI settings, procedure and fluoroscopy times.
- 325 The present study extends this finding on one-year outcome, confirming the high reproducibility of outcome when AF ablation is performed with a point-by-point approach, both in patients with paroxysmal and persistent AF.

Limitations. Firstly, this is a non randomized study. No deviation from the clinical practice of each center and operator was required. Nevertheless, AF ablation registries offer a unique

330 opportunity to collect data from large numbers of patients to examine outcomes. In particular, registries might help assess how ablation is being performed in the "real world" compared with controlled clinical trials that are often performed on a highly selected patient

population in very experienced centers. Secondly, a minority of patients (7.5%) were lost to follow-up. This can be explained by the fact that patients were frequently referred for

ablation by their local cardiologists and were transferred to their care after discharge.
 Lastly, sinus rhythm maintenance was based mainly on patients' symptoms, ECG and
 scheduled 24-hour Holter monitoring. Asymptomatic or short-lasting AF episodes may have
 occurred unnoticed, and our success rate may have been over-estimated.

340

CONCLUSIONS

In conclusion, an ablation protocol respecting strict criteria for contiguity and quality lesion resulted in high rate of one-year freedom from AF recurrence, irrespective of the ablation catheters, and AI settings. The result was reproducible among different operators, both in patients with paroxysmal and persistent AF.

345

REFERENCES

- 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 Jan 1;20(1):e1-e160.
 - 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. Europace. 2016;18:1609-1678.
- 3. Arbelo E, Brugada J, Blomström-Lundqvist C, Laroche C, Kautzner J, Pokushalov E, et al; on the behalf of the ESC-EHRA Atrial Fibrillation Ablation Long-term Registry Investigators. Contemporary management of patients undergoing atrial fibrillation ablation: in-hospital and 1-year follow-up findings from the ESC-EHRA atrial fibrillation ablation long-term registry. Eur Heart J. 2017;38:1303-1316.
- Taghij P, El Haddad M, Philips T, Wolf M, Knecht S, Vandekerckhove Y, Tet al. Evaluation of a strategy aiming to enclose the pulmonary vein with contiguous and optimized radiofrequency lesion in paroxysmal atrial fibrillation. JACC Clin Electrophysiol. 2018;4:99-108.
 - Hussein A, Das M, Chaturvedi V, Asfour IK, Daryanani N, Morgan M, et al. Prospective use of Ablation index targets improves clinical outcomes following ablation for atrial fibrillation. J Cardiovasc Electrophysiol 2017;28:1037-1047.
 - Solimene F, Schillaci V, Shopova G, Urraro F, Arestia A, Iuliano A, et al. Safety and efficacy of atrial fibrillation ablation guided by Ablation Index module. J Interv Card Electrophysiol. 2019;54:9-15.
 - Dhillon G, Ahsan S, Honarbakhsh S, Lim W, Baca M, Graham A, et al. A multicentered evaluation of ablation at higher power guided by ablation index:

370

360

365

375

380

Establishing ablation targets for pulmonary vein isolation. J Cardiovasc Electrophysiol. 2019;30:357-365.

- Solimene F, Lepillier A, De Ruvo E, Scaglione M, Anselmino M, Sebag FA, et al. Reproducibility of acute pulmonary vein isolation guided by the ablation index. Pacing Clin Electrophysiol. 2019;42:874-881.
- Stabile G, Di Donna P, Schillaci V, Di Monaco A, Iuliano A, Caponi D, et al. Safety and efficacy of pulmonary vein isolation using a surround flow catheter with contact force measurement capabilities: A multicenter registry. J Cardiovasc Electrophysiol. 2017;28:762-767.
- 390 10. Park CI, Lehrmann H, Keyl C, Schiebeling J, Allgeier J, Schurr P, et al. Mechanisms of pulmonary vein reconnection after radiofrequencyablation atrial fibrillation: the deterministic role of contact force and interlesion distance. J Cardiovasc Electrophysiol. 2014;25:701-8.
 - 11. Bertaglia E, Stabile G, Senatore G, Zoppo F, Turco P, Amellone C, et al. Predictive value of early atrial fibrillation recurrence after circumferential pulmonary vein ablation. Pace and Clinical Electrophysiology 2005;28:366-71.
 - Nery PB, Belliveau D, Nair GM, Bernick J, Redpath CJ, Szczotka A, et al.
 Relationship between pulmonary vein reconnection and atrial fibrillation recurrence: a systematic review and meta-analysis. J Am Coll Cardiol EP 2016:474–83.
- Arbelo E, Brugada J, Blomström-Lundqvist C, Laroche C, Kautzner J, Pokushalov
 E, et al. Contemporary Management of Patients Undergoing Atrial Fibrillation
 Ablation: In-Hospital and 1-year Follow-Up Findings From the ESC-EHRA Atrial
 Fibrillation Ablation Long-Term Registry. Eur Heart J 2017;38:1303-1316.
 - 14. De Pooter J, Strisciuglio T, El Haddad M, Wolf M, Phlips T, Vandekerckhove Y, et
 - al. Pulmonary Vein Reconnection No Longer Occurs in the Majority of Patients

385

395

405

After a Single Pulmonary Vein Isolation Procedure. JACC Clin Electrophysiol 2019;5:295-305.

15. Ullah W, Hunter RJ, Finlay MC, McLean A, Dhinoja MB, Sporton S, et al. Ablation Index and Surround Flow Catheter Irrigation Impedance-Based Appraisal in Clinical Ablation. J Am Coll Cardiol EP 2017;3:1080-1088.

16. Das M, Loveday JJ, Wynn GJ, Gomes S, Saeed Y, Bonnett LJ, et al. Ablation index, a novel marker of ablation lesion quality: prediction of pulmonary vein reconnection at repeat electrophysiology study and regional differences in target values. Europace 2017;19:775-783.

- 415 17. El Haddad M, Taghji P, Phlips T, Wolf M, Demolder A, Choudhury R, et al.
 Determinants of Acute and Late Pulmonary Vein Reconnection in Contact Force-Guided Pulmonary Vein Isolation: Identifying the Weakest Link in the Ablation Chain. Circ Arrhythm Electrophysiol. 2017 Apr;10(4). pii: e004867.
- 18. Providencia R, Defaye P, lambiase PD, pavin D, Cebron JP, Halimi F, et al. Results
 From a Multicentre Comparison of Cryoballoon vs. Radiofrequency Ablation for
 Paroxysmal Atrial Fibrillation: Is Cryoablation More Reproducible? Europace 2017; 19:48-57.
 - 19. Landolina M, Arena G, Iacopino S, Verlato R, Pieragnoli P, Curnis A, et al. Center Experience Does Not Influence Long-Term Outcome and Peri-Procedural Complications After Cryoballoon Ablation of Paroxysmal Atrial Fibrillation: Data on 860 Patients From the Real-World Multicenter Observational Project. Int J Cardiol 2018;272:130-136.

410

425

FIGURE LEGENDS

Figure 1. Kaplan–Meier estimation of the time to atrial arrhythmia recurrence after the blanking period in patients with paroxysmal and persistent patients.

Figure 2. Kaplan–Meier estimation of the time to atrial arrhythmia recurrence after the blanking period in the four study groups.

435 Figure 3. Kaplan–Meier estimation of the time to atrial arrhythmia recurrence after the blanking period in patients ablated with the ThermoCool SmartTouch (ST) or ThermoCool SmartTouch SF (STSF) catheter.

Figure 4. Kaplan–Meier estimation of the time to atrial arrhythmia recurrence after the blanking period in patients ablated using the high (380-500) or low (330-450) AI setting.

440

445