

Persistent Atrial Fibrillation Ablation Using Circular Irrigated Ablation Catheter

Nora Al-Jefairi^{1*}, Ruairidh Martin¹, Jean-Marc Sellal¹, Xavier Pillois¹, Arnaud Denis¹, Nicolas Derval¹, Frédéric Sacher^{1,2}, Méléze Hocini^{1,2}, Michel Haïssaguerre^{1,2}, Pierre Jais^{1,2}

¹Department of Cardiac Pacing and Electrophysiology, Hôpital Cardiologique du Haut Lévêque, CHU de Bordeaux, Pessac, France

²IHU LIRYC, Université de Bordeaux – Inserm U1045, Pessac, France

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*Corresponding author: Nora Al-Jefairi, Department of Cardiac Pacing and Electrophysiology, Hôpital Cardiologique du Haut Lévêque, CHU de Bordeaux, Pessac, France, E-mail: n.aljefairi@hotmail.com

Abstract

Introduction: Persistent atrial fibrillation (PsAF) ablation remains time consuming, even when guided by non-invasive mapping. We investigated the role of a multielectrode irrigated circular radiofrequency (RF) catheter for PsAF ablation.

Methods: A circular catheter (nMARQ®, Biosense Webster, Inc) with 10 irrigated simultaneous mapping and ablation electrodes was used in 50 patients with PsAF (age 60 ± 11 years, left atrial (LA) size 21.8 ± 9.7 cm² and atrial fibrillation (AF) maximum duration 10.6 ± 9.3 months). Ablation was guided by non-invasive mapping (ECVUE™, Cardioinsight Inc.) in 32 (64%) patients. Pulmonary vein isolation (PVI) was systematically performed.

Results: After targeting additional non-PV regions including 3 \pm 2 indicated by ECVUE™ (1-6), AF terminated in 37 (74%) patients, into atrial tachycardia (AT) in 22 and directly into sinus rhythm (SR) in 15 patients. Thirteen patients were in SR during the procedure. PVI required 8.01 ± 5.27 minutes of RF. Eleven patients required direct current (DC) shock to terminate AF. Linear lesions were performed for AT: 14 LA roof lines, 13 mitral isthmus lines and 27 cavo tricuspid isthmus (CTI). Using total of 20.24 ± 17.25 minutes of RF. Interestingly, 5/8 roof line block, 4/5 mitral isthmus line block and 19/24 CTI line block, were blocked with circular catheter only with 5.08 ± 4.58 , 3.30 ± 2.56 and 3.26 ± 2.12 minutes of RF duration, respectively. A single tip conventional ablation catheter was required to complete linear lesions and obtain the block in 3 roof lines, 1 mitral isthmus line and 5 CTI. Mean procedure duration was 3.18 ± 1.03 hours. Complications included 1 pericardial effusion managed conservatively and 1 transient ischemic attack (TIA) resolved without any neurological sequelae. One year follow up data was available in 27 (54%) patients, 18 (67%) patients were in SR and 9 (33%) patients had AF recurrence in whom 1 (3%) patient had AT recurrence.

Conclusion: Circular radiofrequency ablation catheter demonstrated encouraging results for rapid, safe and effective PsAF ablation when guided by non-invasive phase mapping. The catheter can be used for linear ablations and CTI in addition to PVI, thus obviating the need for an additional ablation catheter in the majority of patients.

Introduction

Catheter ablation for persistent atrial fibrillation (PsAF) remains time consuming due to issues such as undue radiofrequency (RF) application, long procedural duration and post-procedural atrial tachycardia (AT)[1]. Different ablation techniques and strategies were available to treat PsAF and improve clinical outcomes, including pulmonary vein isolation (PVI) only, ganglionated plexi ablation, linear lesions in the left atrium (LA), complex fractionated atrial electrogram (CFAE)-based ablation stepwise approach and driver-based ablation[2-10].

Pulmonary Vein Isolation (PVI) role in PsAF is debatable but likely to be limited because of the additional involvement of LA substrate (fibrosis) maintaining atrial fibrillation (AF) due to extensive electrical and anatomical remodeling[11]. A new technology for AF analysis using commercially available non-invasive body surface mapping (ECVUE™ Cardioinsight Technologies) to identify multiple atrial wavelets, macro-reentries and localized sources (focal or re-entry/rotor), which played an important role in driving and maintaining AF, and reported to be effective in catheter ablation of PsAF[11-13].

The circular, irrigated multi-electrode catheter (nMARQ®, Biosense Webster, Inc) was introduced for simultaneous mapping and radiofrequency ablation, and demonstrated high success rate and short procedure time for paroxysmal and persistent AF ablation[15-18]. Previous studies suggested that further research was needed to clarify long-term outcome[16, 18, 19]. Nevertheless, the occurrence of esophageal fistulas with fatal outcome in some studies was of major concern[16, 18, 19]. Therefore, the catheter was recalled from the market in June 2015 for further investigation[20]. However, the knowledge gained using this catheter should be used to develop better ablation tools for the future.

This study aimed to evaluate safety and efficacy of the circular catheter combined with noninvasive mapping technologies in

PsAF patients, and to investigate and assess the role/efficacy and the safety of the catheter in non-PV/ linear lesions and success rates at 3, 6 and 12 months.

Methods

Study Design

A circular mapping and radiofrequency ablation catheter (nMARQ®) with 10 irrigated electrodes were used in PsAF patients. PVI ablation was systematically performed. Additional ablations for non-PV sites were guided either by CARTO® 3 (Biosense Webster Inc) (CFAE based ablation) with or without additional noninvasive mapping ECVUE™ Cardioinsight (driver-based ablation). Procedure end point was AF termination into sinus rhythm (SR) or into atrial tachycardia (AT). In case of AF termination into AT, further mapping and ablation was performed accordingly. Linear lesions (mitral and/or roof lines) were performed for macro-reentrant AT only. Cavo Tricuspid Isthmus (CTI) line was performed in presence of typical flutter history or previous CTI line that was no longer blocked. A conventional single tip ablation catheter was occasionally required to complete linear lesions and obtain complete block. Follow-up data was collected at 3, 6, 12 months to assess success and recurrence rates.

Study Population

Inclusion criteria included PsAF, refractory to at least 1 antiarrhythmic drug (AAD), and of duration > 7 days[21]. Exclusion criteria included the presence of LA thrombus, sub-therapeutic or contraindication to anticoagulation (AC), significant valvular heart disease, and New York Heart Association (NYHA) class III or IV heart failure. Written informed consent was obtained from all patients. The study was approved by the ethic committee.

Non-Invasive Body Surface Mapping (ECVUE™ Cardioinsight Technologies™) Guided Ablation

Signal acquisition from the patient and subsequent computational methods used in the reconstruction of non-invasive maps using multiple torso electrodes have been described previously[11, 14, 22]. Briefly, a 252-electrodes vest was applied to the patient's torso and connected to the non-invasive imaging system, and surface potentials were recorded[22]. It was followed by a non-contrast thoracic CT scan acquiring 64 section multi-detector[11] to obtain high-resolution images of the heart and the vest electrodes[22]. The 3D epicardial bicameral atria geometries were reconstructed from segmental CT images[22]. The relative positions of body surface electrodes were visualized on the torso geometry[22]. The system reconstructed epicardial potentials, unipolar electrograms and activation maps from torso potentials during each beat/cycle using mathematical reconstruction algorithms. Details of the mathematical methods were provided in previous publications[23-27]. For the purpose

of this study, atrial fibrillation (AF) electrograms were acquired during a long ventricular pause – spontaneous or diltiazem-induced to map atrial activity[11]. AF maps were created using specific algorithms combining wavelet transform and phase mapping applied to the reconstructed epicardial potentials[11]. Activation maps were computed using traditional unipolar electrogram intrinsic deflection based (dV/dT) max method[11]. AF drivers were classified into two categories: (i) focal activation with centrifugal propagation from a point and (ii) re-entry/rotor demonstrating rotated wave with full-phase propagation around a functional or anatomical center point[11]. The core and trajectory of re-entrant drivers and focal sources were depicted on the patient-specific biatrial geometry[28, 29]. The number of foci and re-entry through the total duration of all AF windows were displayed on cumulative driver-density maps[11]. The order of ablation was determined based on the cumulative driver map[11]. After acquiring atrial geometry on 3D-electroanatomical mapping system (CARTO® 3, Biosense Webster Inc), the region having the highest density of re-entrant drivers was targeted first followed by the region with the second-highest driver density and so on[11]. Within the driver area, rapid and continuous fragmented signals and the activation gradient between proximal and distal electrodes were preferentially targeted for ablation[7] (Figure 1).

The endpoint of RF application was PVI with nMARQ® circular catheter, elimination of fragmented potential and slowing of the AF cycle length (CL) at the local site[11]. Each RF application targets dominant clusters of AF driver at 25 Watt (W) (Max 20 W in the posterior wall) using the nMARQ® circular catheter with temperature cut-off set at 45°C[11]. If AF persists after ablation of the first targeted region, the second-highest density area of driver was subsequently ablated in the same way[11]. Non-PV sites were ablated using nMARQ® circular catheter or with conventional catheter as needed. Unipolar ablation with power delivery of 25 W was performed at all non-PV sites (Max 20 W for posterior wall).

The endpoint of the procedure was AF termination into sinus rhythm (SR), atrial tachycardia (AT) or completion of RF applications targeting all driver areas[11]. PVI was systematically performed. Re-entrant drivers were preferred target versus focal drivers as they have previously been shown to be strongly associated with AF termination[29]. Importantly, drivers with good quality signals on the non-invasive map were considered as priority targets regardless of their type[11]. If AF persisted after driver-based ablation and PVI, it was terminated by electrical cardioversion[11].

Invasive Mapping (CARTO® 3 System) Guided Ablation

PVI using the nMARQ® circular catheter and generator has previously been described[15]. Briefly, all patients were on anticoagulation therapy for at least 4 weeks before procedure. After femoral access, a decapolar catheter (Xtrem, Sorin) was

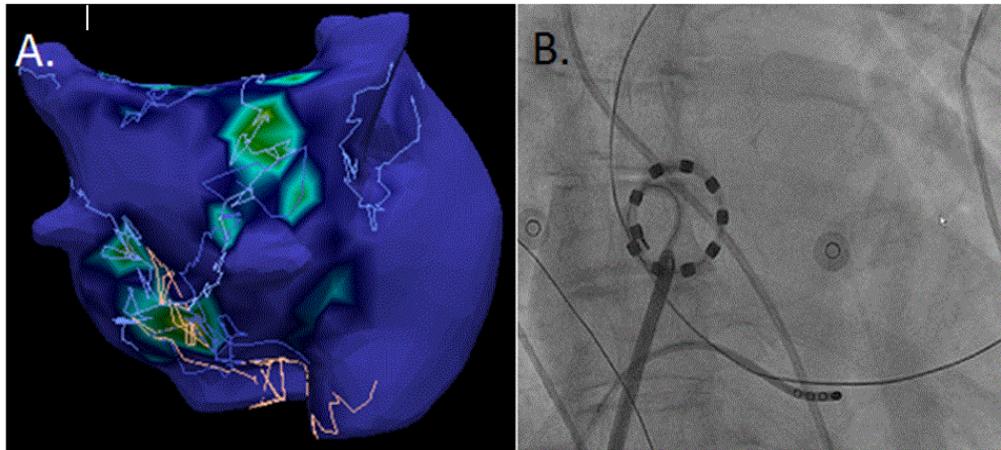


Figure 1A: Phase mapping demonstrating a posterior view of the left atrium persistent AF patient. Rotors (green and turquoise) are located on the inferolateral left atrium as well as adjacent to the right pulmonary veins. The rotors adjacent to the right pulmonary vein are stable. Those at the inferolateral aspect of the left atrium are more unstable. The line in peach indicates the trajectory of an unstable rotor. **B:** Radiographic image of the nMARQ catheter on the posterior wall adjacent to the right pulmonary veins targeting multiple rotors.

positioned in the coronary sinus (CS). Access into the LA was obtained by transeptal (TS) puncture under fluoroscopic and pressure guidance (98 cm BRK needle, Agilis sheath, St. Jude Medical, St. Paul, MN, USA; Direx sheath, Bard, Lowell, MA, USA). Following transeptal puncture, activated clotting time (ACT) was maintained at > 300 seconds using heparin boluses. The sheath was continuously perfused with heparinized saline at 200 mL/h.

Three-dimensional (3D) LA geometry was created using circular, open-irrigated catheter nMARQ® mapping catheter (Biosense Webster, Irwindale, CA USA) and the CARTO® 3 mapping system (Biosense Webster, INC. Diamond Bar, CA, USA)[16]. All patients underwent PVI using nMARQ®. In cases where AF terminated into AT or Flutter (FL), activation map and additional ablation to target the sources using either circular or single tip irrigated (Navistar Thermocool (TC) SF Biosense Webster, Irwindale, CA, USA) ablation catheter were performed.

Post-Procedural Management and Follow-Up

Post-procedural oral anticoagulation and antiarrhythmic drugs (AADs) were continued for 3 months and thereafter according to individual CHADS VASc risk scores. Treatment with proton pump inhibitor (PPI) was prescribed for 2 weeks in all patients. In case of AF recurrence, cardioversion was recommended to restore sinus rhythm (SR).

Follow-up (FU) at 3, 6 and 12 months was collected. Recurrence of AF defined as any AT lasting > 30 seconds on a 24h Holter or 12 lead ECG. Procedure-related major adverse events (embolic complications, phrenic nerve damage, vascular complications, PV stenosis and death) were recorded in all patients.

Statistics

Continuous variables were expressed as mean \pm SD. Categorical data were expressed as counts and percentages. Continuous variables were compared using Student t tests or the non-parametric Mann-Whitney U test as appropriate. Categorical variables were compared using Fisher's exact or Pearson's chi-square tests as appropriate. All univariate predictors with p-values < 0.05 were considered statistically significant. All statistical analyses were performed using SPSS version 21.0 (SPSS, Inc.,) and Prism version 5.00 (GraphPad Software).

Results

Clinical Characteristics

A total of 50 patients with symptomatic, drug-refractory, PsAF were included in the study. They were predominantly male (90%), aged 60 ± 10.5 years. Left ventricular ejection fraction (LVEF) was $49.2 \pm 22.6\%$. Left atrial surface area and volume were 21.8 ± 9.7 cm², 68.5 ± 47.7 ml respectively. Clinical characteristics are summarized in table 1.

Procedural Details

Of the 50 patients with PsAF treated using the nMARQ® circular radiofrequency catheter ablation, 32 (64%) patients underwent ablation guided by non-invasive mapping (ECVUE™, Cardioinsight Inc.). Thirty-seven (74%) patients presented in AF while the arrhythmia was induced in 13 (26%) patients. PVI was performed in 47 (94%) patients using 8.01 ± 5.27 minutes of RF. RF time in right pulmonary veins (RPVs) was 4.45 ± 2.47 minutes and left pulmonary veins (LPVs) was 4.36 ± 2.40 minutes. A conventional ablation catheter was required in 16 (33%) patients, to treat non-PV substrate sites in 7 patients and linear lesions in 9 patients.

Table 1:	
Baseline patient characteristics	N = 50
Age, mean ± SD (years)	60 ± 10.5
AF diagnosis time, mean ± SD (months)	49 ± 71.1
AF maximum duration time mean ± SD (months)	10.6 ± 9.3
Direct current (DC) shock for AF, n (%)	39 (78)
CAHDS VASC ≥ 2, n (%)	20 (40)
Diabetes mellitus (DM), n (%)	8 (16)
Hypertension (HTN), n (%)	16 (32)
Coronary artery disease (CAD), n (%)	4 (8)
Dilated/hypertrophic cardiomyopathy (DCM/HCM), n (%)	10 (20)
Congenital heart disease (CHD), n (%)	1(2)
Valvopathy, n (%)	16 (32)
Cerebrovascular accidents, n (%)	4 (8)
Paroxysmal nocturnal dyspnea (PND), n (%)	5 (10)
Left ventricular ejection fraction (LVEF), mean ± SD	49.2 ± 22.6
Left atrial surface area, mean ± SD	21.8 ± 9.7
LA volume, mean ± SD	68.5 ± 47.7
Total number of AADs, mean ± SD	2 ± 0.9
1 AADs, n (%)	21 (43.8)
2 AADs, n (%)	17 (35.4)
3 AADs, n (%)	7 (14.6)
4 AADs, n (%)	2 (4.2)
Amiodarone, mean n (%)	30 (60)

A total number of 46 (92%) patients had ablation for non-PV sites (CFAE based or driver based) with an additional RF time of 17.24 ± 12.42 minutes. At least 1 linear ablation was performed for macro-reentrant AT in a total of 19 (38%) patients (roof line n = 14, mitral isthmus line n = 13). Roof line block was obtained in 8/14 (57%) patients in whom 5 patients had block with the circular catheter only and 3 patients had a backup block ablation with the conventional catheter. Total RF time for roof line was 6.34 ± 4.58 minutes and RF time for roof line with the circular catheter only was 5.08 ± 4.58 minutes. Mitral isthmus line block was obtained in 5/13 (39%) patients in whom 4 patients had block with the circular catheter and 1 patient had block with conventional catheter. Total RF time for mitral isthmus line was 9.50 ± 9.24 minutes and RF time for mitral isthmus line with the circular catheter only was 3.30 ± 2.56 minutes. Cavotricuspid isthmus (CTI) line was performed in 27 (54%) patients resulting in complete block in 24 (89%) patients of whom 19 had block using the circular catheter only. Total RF time for CTI line was 4.40 ± 3.43 minutes and RF time for CTI ablation with the circular catheter only was 3.26 ± 2.12 minutes.

AF was terminated in 37 (74%) patients, in 15 (31%) patients into SR, and into AT terminated by ablation in 12 (25%) patients

and into AT terminated by direct-current (DC) shock in 10 (20%) patients. In patients in whom RF ablation failed to terminate AF, DC shock was used in 11 (22%) patients and AAD injection was used in 1 (2%) patient. AAD were used in combination with DC shocks were used in 10 (20%) patients.

The total procedural RF time was 31.13 ± 17.31, total procedure time was 3.18 ± 1.03 hours and X-ray duration was 45.53 ± 22.46 minutes.

Non-Invasive Mapping-Guided Ablation

Non-invasive mapping-guided ablation was applied in 32 (64%) patients. After targeting 3 ± 2 additional non-PV sites as indicated by ECVUE™ (1-6), PVI was performed in 30 (93%) patients, non-PV sites were ablated in 31 (97%) patients and linear ablations were performed in 9 patients (28%). RF time for PVI was 8 ± 5.27 minutes (RPVs RF was 4 ± 3.03 minutes and LPVs RF was 4.21 ± 2.59 minutes), RF time for non-PV sites was 14.54 ± 10.3 minutes. Use of an additional conventional ablation catheter was required in 12 (38%) patients for backup ablation in 6 patients for non-PV sites ablation and in 6 patients for linear ablation.

Linear ablation was done in 12 (38%) patients. Roof line was ablated in 5 patients and mitral isthmus line was ablated in 7 patients. Roof block was obtained in 2/5 (40%) patients of whom 1 patient had block with the circular catheter only and 1 patient required additional RF using a conventional catheter touchup. Total RF time for roof line was 2.40 ± 0.58 minutes and with circular catheter only ablation was 4.00 minutes. Mitral isthmus block was obtained in 2/7 (29%) patients of whom 1 had block with the circular catheter and 1 required additional RF using a conventional catheter for touchup. Total RF time for mitral line was 7.39 ± 2.58 minutes and with the circular catheter only was 6.0 minutes. CTI ablation was performed in 15 (47%) patients resulting in complete block in 13 (87%) patients of whom 8 patients had block with the circular catheter only and 5 required additional RF using a conventional catheter. Total RF time for the CTI line was 4.07 ± 2.40 minutes and for the circular ablation only was 3.07 ± 0.54 minutes.

AF was terminated in 25 (78%) patients, into SR in 9 (28%), AT terminated by ablation in 9 (28%), AT terminated by DC shock in 7 (22%) patients. In patients in whom RF ablation failed to terminate AF, DC shock was used in 6 (19%) patients and AAD was used in 1 (3%) patient. Total RF ablation was 29.44 ± 15.43 minutes, procedure time was 3.35 ± 0.57 hours and x-ray was 47.51 ± 25.54 minutes.

Safety Outcomes

Of the 50 patients who underwent ablation with the circular catheter ± non-invasive mapping-guided ablation for PsAF, 2 (4%) patients (neither of whom received non-invasive mapping guided ablation) had steam pop with the circular catheter on CTI (25 W, total RF duration 5 minutes) and on superior vena cava (SVC) (25 W, total RF duration 30 seconds), with no adverse consequences and 1 (2%) patient had a transient ischemic stroke (TIA) with aphasia resolved without sequelae.

Short and Long-Term Outcome

Follow-up data was collected at 3, 6 and 12 months. Details are shown in Table 2.

Re-ablation was performed in 9 patients at 3 months follow up, 5 patients at 6 months follow up and 5 patients at 12 months follow up.

At 12 months, 27 (54%) patients follow up data was

available, 18 patients (67%) were in SR and 9 (33%) patients had recurrence, in whom 8 patients had AF and 1 patient had AT. Five patients (19%) underwent a fourth ablation procedure, 3 (11%) patients were treated with AADs. and 1 patient data was not available.

Discussion

This study reports efficacy, safety and 1-year outcome using circular, multielectrode, irrigated simultaneous mapping and ablation catheter for PsAF ablation. In most patients in this series, the procedure was guided by non-invasive mapping (ECVUE™ Cardioinsight Technologies). This study demonstrates that the combination can be safely used and allowed a long-term efficacy of 67% in the entire patients and 61% when guided by non-invasive mapping from the data available. The circular catheter proved interesting versatility in this study, being successfully used to target non-PV regions hosting rotors in 100% of cases. Linear ablation could also be completed by the circular catheter, particularly at CTI, and also for roof and mitral lines.

Efficacy

nMARQ® efficacy in PsAF ablation was associated with 52-96% success rate and short ablation time as reported in previous studies and was comparable to our study [16, 18, 30]. Moreover, the study demonstrated that the circular catheter was feasible in non-PV ablation sites, when compared to other PsAF techniques such as cryoballoon ablation (Medtronic Inc., Carlsbad, CA USA) that was exclusively developed to fit PVs only, including CFAE or driver-based ablation and linear ablation (roof block with nMARQ® was 63% (RF duration was 5.08 ± 4.07 minutes), mitral isthmus block with nMARQ® was 80% (RF duration was 3.30 ± 2.56 minutes) and in CTI was 79% (RF duration was 3.26 ± 2.12 minutes), in addition to achieving successful PVI (94%). Non-PV sites ablation with nMARQ® alone was reported to be effective in blocking CTI and roof lines with limited number of RF application (6.0 ± 4.9 minutes, 4.8 ± 2.9 minutes, respectively) without the need for additional ablation with conventional catheter, however, in the reported study was a cohort multi-center study that had small number of PsAF patients underwent non-PV ablation (30/111 (27%) patients including linear ablations[16]. The circular catheter was also effective for simultaneously targeting multiple left and right atrial sites with high-frequency fractionated signals[16].

The procedure time for PsAF with PVI only was reported to be 75 minutes and PVI with additional non-PV sites ablation was reported to be 144 minutes [16, 18]. We reported 180 minutes including non-invasive phase mapping time. In the non-randomized study comparing nMARQ® to smart touch, procedural time was similar regardless of the catheter used (smart touch 115 ± 17 minutes versus nMARQ® 125 ± 24 minutes, $p = 0.200$)[30].

Follow up, N (%)	SR	AF	AT
3 months n= 24 (48)	12 (50)	7 (29)	5 (21)
6 months n= 22 (44)	12 (55)	6 (27)	4 (18)
12 months n= 27 (54)	18 (67)	8 (30)	1 (3)

Safety

In 50 patients, 1 (2%) patient had transient ischemic stroke with aphasia resolved without sequelae. Incidence of ablation-related asymptomatic cerebral events (ACE) in previous studies varies between 2% and 41% [31-40]. The platinum-tipped PVAC® catheter (Medtronic Inc., Carlsbad, CA USA) was associated with highest rates of ablation-related ACE due to non-irrigated radiofrequency ablation, which increased the risk of thrombus formation. In a meta-analysis neurological embolic complications have previously been reported with circular multielectrode ablation catheter technologies such as the PVAC® catheter (Medtronic Inc.) in 0.63% [41]. The nMARQ® multielectrode ablation system has similarities to the PVAC® ablation catheter but the difference is that the nMARQ® catheter is continuously irrigated. None of the previous studies on nMARQ® outcomes had reported clinical strokes [15, 19, 42-44]. Nevertheless, a small cohort study identified silent cerebral lesions (SCL) in 14/43 (33%) following nMARQ® ablation [19]. The findings emphasize the importance of uninterrupted oral anticoagulation and maintenance of higher activated clotting times (ACT) during nMARQ® ablation. In another study comparing between PVAC® and nMARQ® showed that the ablation-related silent cerebral events (SCE) rate is similar between both groups [31-40]. Though a randomized study comparing the incidence of SCE after PVAC®, nMARQ® and thoracoscopic surgical AF ablation reported higher number of ablation-related SCE in the PVAC®: 2 (13.3 %) patients, 1 (6.7%) patient in nMARQ® with 1 patient that did not resolve at 3 months and no surgical patients with ablation-related ACE [45]. Of note, the study reported high background prevalence of MRI-detected cerebrovascular disease at baseline that was not ablation related (5.1%) and at 3 months (3.3%) [45]. No major post procedural complications or mortalities occurred such as atrio-oesophageal fistula, pulmonary vein stenosis or phrenic nerve palsy (PNP) in this study. The explanation was that we performed ablation under local anesthesia and sedation, therefore ablation was discontinued as soon as the patient started to have pain, in addition to the caution we added in ablating the posterior LA wall by adapting the energy settings and polarity, therefore, such complications did not occur in our series compared to ablation procedures that were done under general anesthesia that reported fatal oesophago-pericardial fistula and fatal atrial-oesophageal fistula in previous studies [18, 46].

Long-Term Outcome

The outcomes of nMARQ® ablation at 1 year were comparable to conventional ablation [16]. In a meta-analysis of 6 studies reporting outcomes of PsAF ablation with conventional catheters, 1-year success rates were 52% [47]. In the multi-center cohort study of nMARQ® catheter for PsAF, 65% of patients were free from AF at 1 year [16], although these results should be interpreted with caution because of significant heterogeneity in the ablation strategy, the additional use of conventional ablation to nMARQ®

and the small number of patients (18%) in the follow-up data as previously mentioned. In the largest single-center series where PVI only was treated with PsAF ablation, 6 months success rate was 52% [18]. The present identified a success rate of 55% and 67% arrhythmia free at 6 months and 12 months in the available data of 44% and 54% patients, respectively.

Limitations

The study was a single center study. We did not routinely monitor esophageal temperature during ablation or perform post ablation esophageal endoscopy or cerebral imaging (MRI) to rule out esophageal injury and cerebral lesions. However, we did not observe any esophageal or cerebral complication related to the circular catheter. 1- year follow-up data were only available in 54% of patients.

Conclusions

The circular multielectrode irrigated mapping and radiofrequency ablation catheter demonstrates encouraging results for rapid, effective and safe technique in PsAF ablation, especially when guided by non-invasive mapping. The circular catheter was feasible for non-PV CFAE or driver passed ablation and can be used effectively and safely for CTI and linear ablations in addition to PVI. Therefore, obviating the need for an additional ablation catheter in the majority of patients.

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Disclosure

Dr. Nora Al Jefairi has no conflict of interest. Drs. Pierre Jais, Frederic Sacher, MelezeHocini and Michel Haissaguerre have received lecture fees from Biosense Webster for 10.000 USD annually. Other authors have no disclosures.

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