Pulmonary Vein Isolation with nMARQ Catheter

Phi Wiegn, MD

SPONTANEOUS INITIATION OF ATRIAL FIBRILLATION BY ECTOPIC BEATS ORIGINATING IN THE PULMONARY VEINS

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New England Journal of Medicine 1998; 339:659-666.

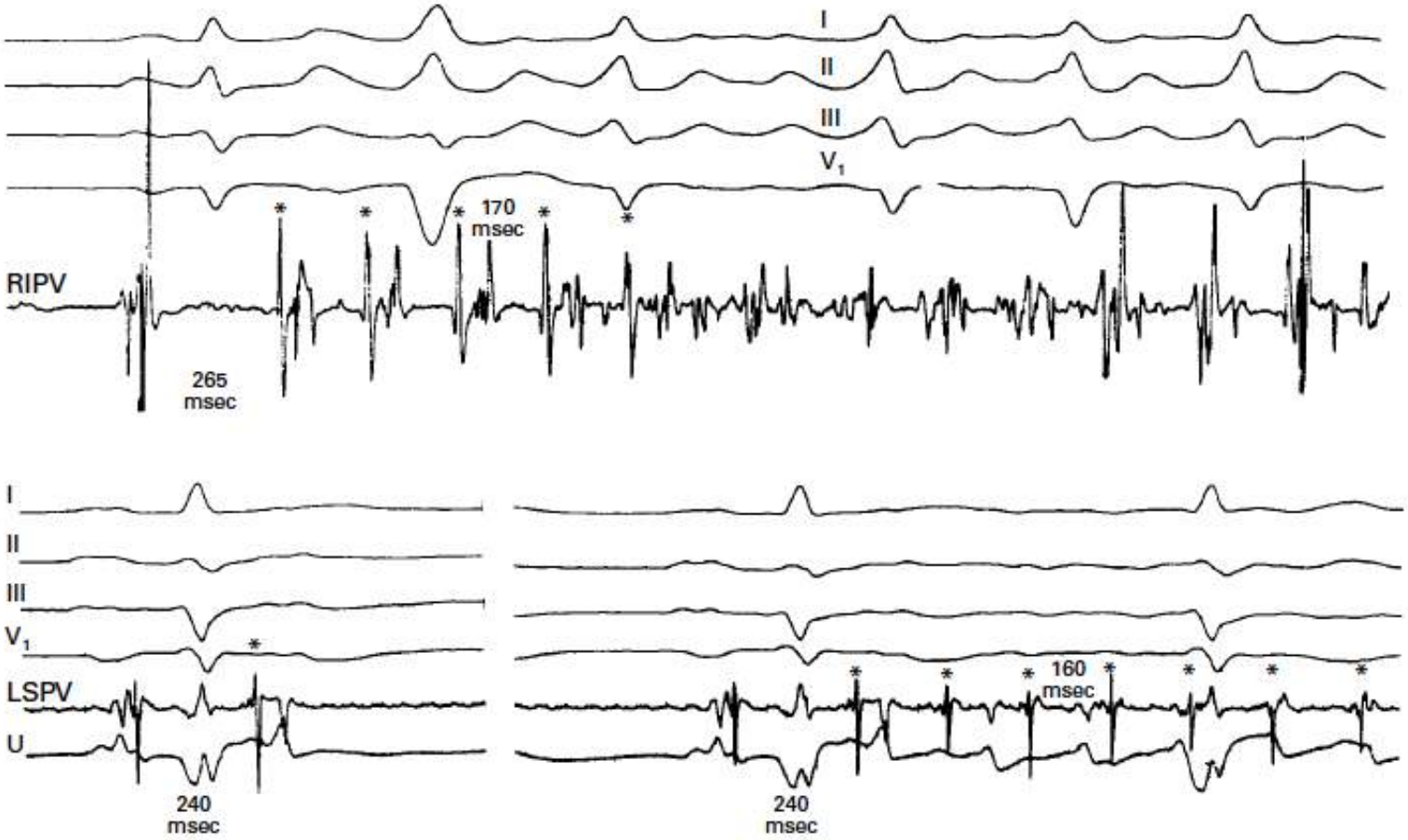
Using multi-electrode catheter to map for atrial foci precipitating AF in 45 patients with drug refractory PAF

-29 patients (62%) with one focus

-9 patients (20%) with 2 foci

-7 patients (16%) with more than 3 foci.

Ectopic beats precipitating AF from RIPV & LSPV



Haissaguerre et al. NEJM 1998; 339:659-666.

PV ectopic beats precipitating AF

-94% of ectopic beats originating from inside PVs

-45% LSPV, 25% RSPV, 16% LIPV and 9% RIPV

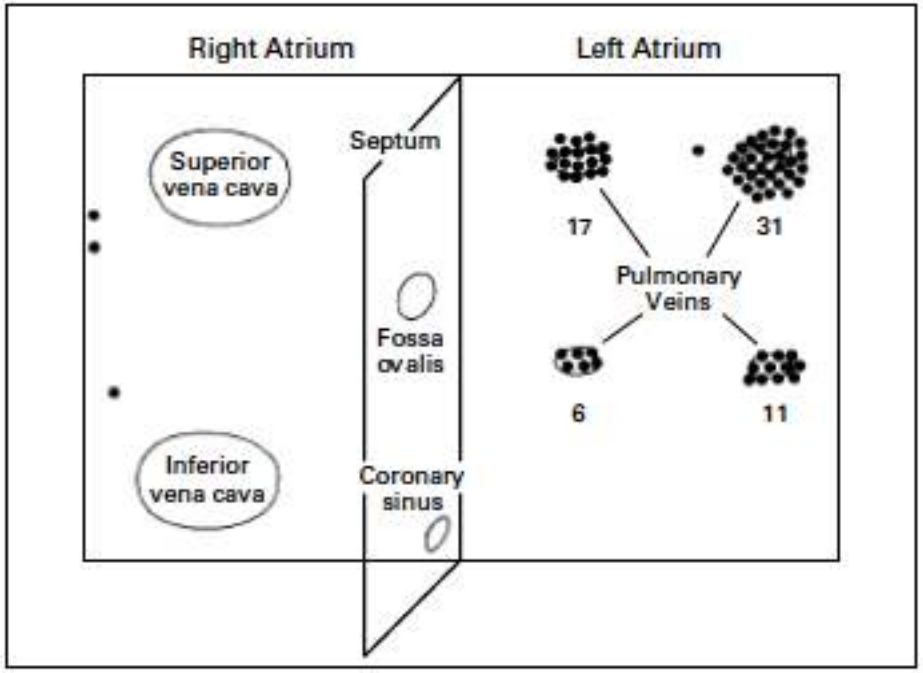
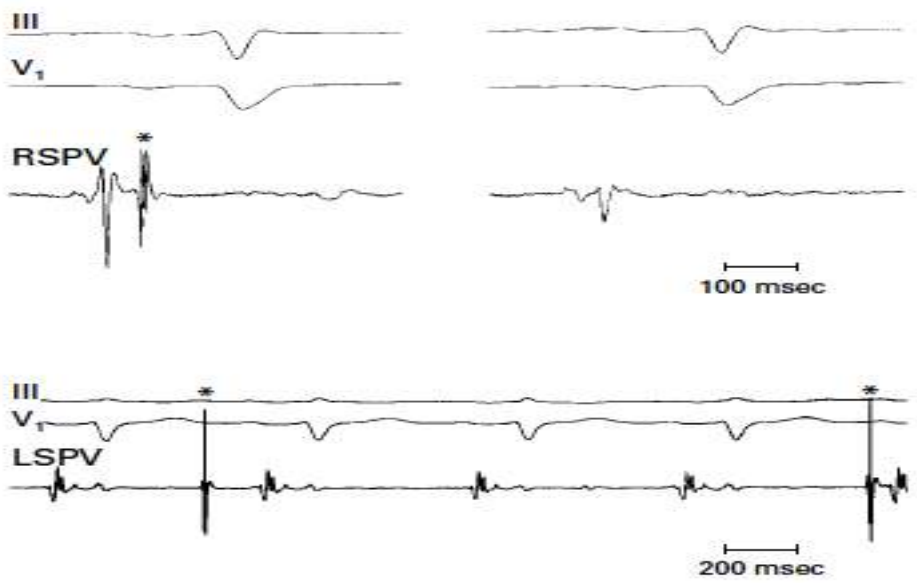


Figure 1. Diagram of the Sites of 69 Foci Triggering Atrial Fibrillation in 45 Patients.
Note the clustering in the pulmonary veins, particularly in both superior pulmonary veins. Numbers indicate the distribution of foci in the pulmonary veins.

Haissaguerre et al. NEJM 1998; 339:659-666.

Successful RF ablation of ectopic PV potential



- RF ablation was successful in 38 patients
- 28 (62%) patients remained in sinus rhythm at 8 ± 6 month follow up

Haissaguerre et al. NEJM 1998; 339:659-666.

Circumferential Radiofrequency Ablation of Pulmonary Vein Ostia

A New Anatomic Approach for Curing Atrial Fibrillation

Carlo Pappone, MD, PhD; Salvatore Rosanio, MD, PhD; Giuseppe Oreto, MD; Monica Tocchi, MD; Filippo Gugliotta, BS; Gabriele Vicedomini, MD; Adriano Salvati, MD; Cosimo Dicandia, MD; Patrizio Mazzone, MD; Vincenzo Santinelli, MD; Simone Gulletta, MD; Sergio Chierchia, MD

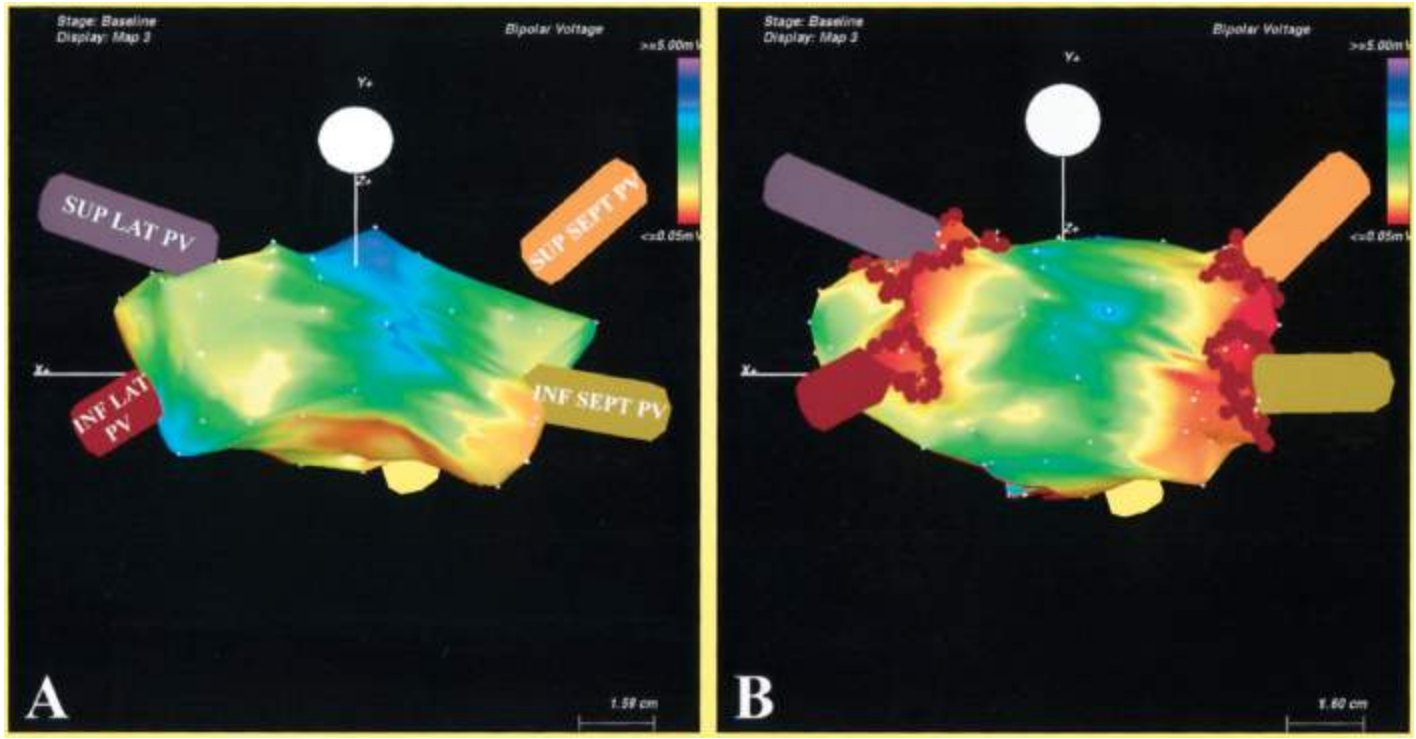
Circulation 2000; 102:2619-2628.

-Anatomical approach guided by 3D electroanatomic mapping to perform circular lesions around the ostia of the PV to achieve PV isolation.

-26 patients with drug resistant paroxysmal AF (14) and persistent AF (12)

Circumferential PV Isolation

Voltage Map



Pre-ablation Post-ablation

Pappone et al. Circulation 2000; 102:2619-2628.

Circumferential PV Isolation

TABLE 3. Procedural and Follow-Up Results

Patient	Procedure Duration, min	Fluoroscopy Time, min	Mapping Time, min	RF Pulses, No.	F/U Time, mo	AF Recurrence	F/U Drugs‖
1	297	26	56	108	6	No	None
2*†	330	28	79	110	15	No	None
3	280	28	59	124	12	No	Amiodarone
4*†	390	29	85	141	12	No	None
5	206	31	52	92	6	No§	None
6*†	341	25	77	94	8	No	None
7*	295	30	112	148	10	No	Verapamil
8*†	374	30	81	150	6	Yes	Digoxin
9*	388	33	108	133	11	No	Verapamil
10*†	290	24	82	97	14	Yes	Amiodarone
11*	331	22	123	103	7	No	Verapamil
12	290	26	59	121	6	No	Amiodarone
13*	350	27	119	140	8	No	β-Blockers
14‡	250	21	61	127	9	No	Sotalol
15	235	22	64	117	7	No	None
16	198	26	55	112	14	No	None
17*†	342	28	91	99	10	No	None
18‡	206	25	60	121	12	No	Propafenone
19*	282	28	124	132	9	Yes	Digoxin and β-blockers
20*†	232	26	85	104	10	No	None
21*†‡	320	22	91	126	11	No	Propafenone
22	290	25	65	130	8	No	None
23	215	22	69	108	9	No	None
24	298	22	61	131	10	No	Amiodarone
25*†	320	27	87	115	6	No	β-Blockers
26	202	29	60	102	9	Yes	None
Mean±SD	290±58	26±3	80±22	118±16	9±3		

-In 9 of 14 patients who were in AF, SR was restored acutely during RF.

-Complete PV isolation was documented In 79 of 104 PVs (76%).

-At 9 ± 3 month F/U, 22 patients (85%) had no recurrence of AF with 62% off AAD.

-Similar suppression for both paroxysmal and persistent AF.

-4% of significant pericardial effusion.

Pappone et al. Circulation 2000; 102:2619-2628.

Complete Isolation of Left Atrium Surrounding the Pulmonary Veins

New Insights From the Double-Lasso Technique in Paroxysmal Atrial Fibrillation

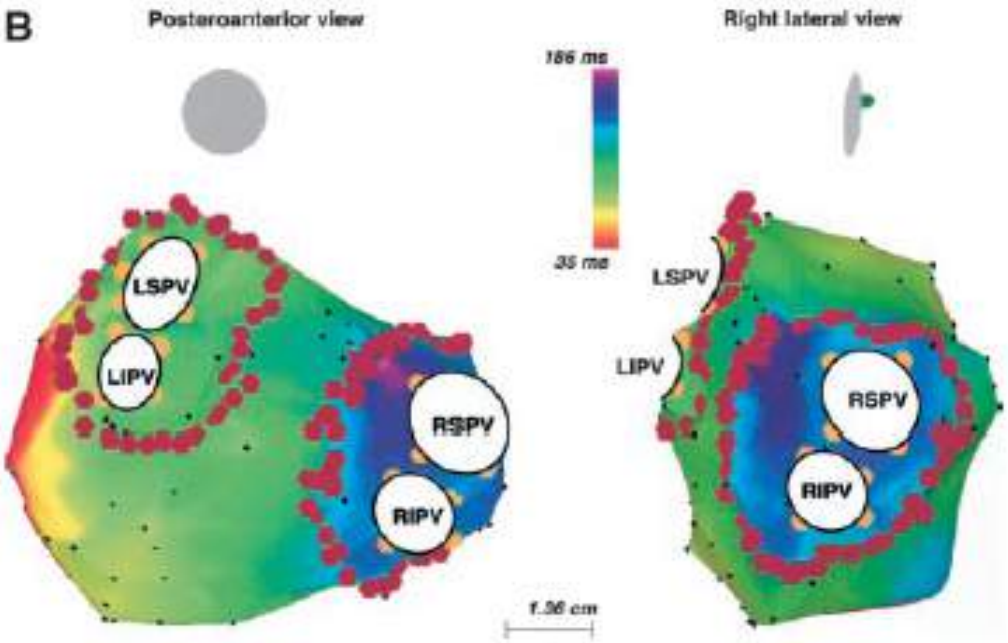
Feifan Ouyang, MD; Dietmar Bänsch, MD; Sabine Ernst, MD; Anselm Schaumann, MD; Hitoshi Hachiya, MD; Minglong Chen, MD; Julian Chun, MD; Peter Falk, MD; Afsaneh Khanedani, MD; Matthias Antz, MD; Karl-Heinz Kuck, MD

Circulation 2004; 110:2090-2096.

-Double Lasso technique to perform wide area circumferential ablation to isolate ipsilateral pair of PVs. The goal was to isolate not just the PVs but also LA-PV junction.

-41 patients with drug resistant and symptomatic paroxysmal AF

Continuous Circular Lesions



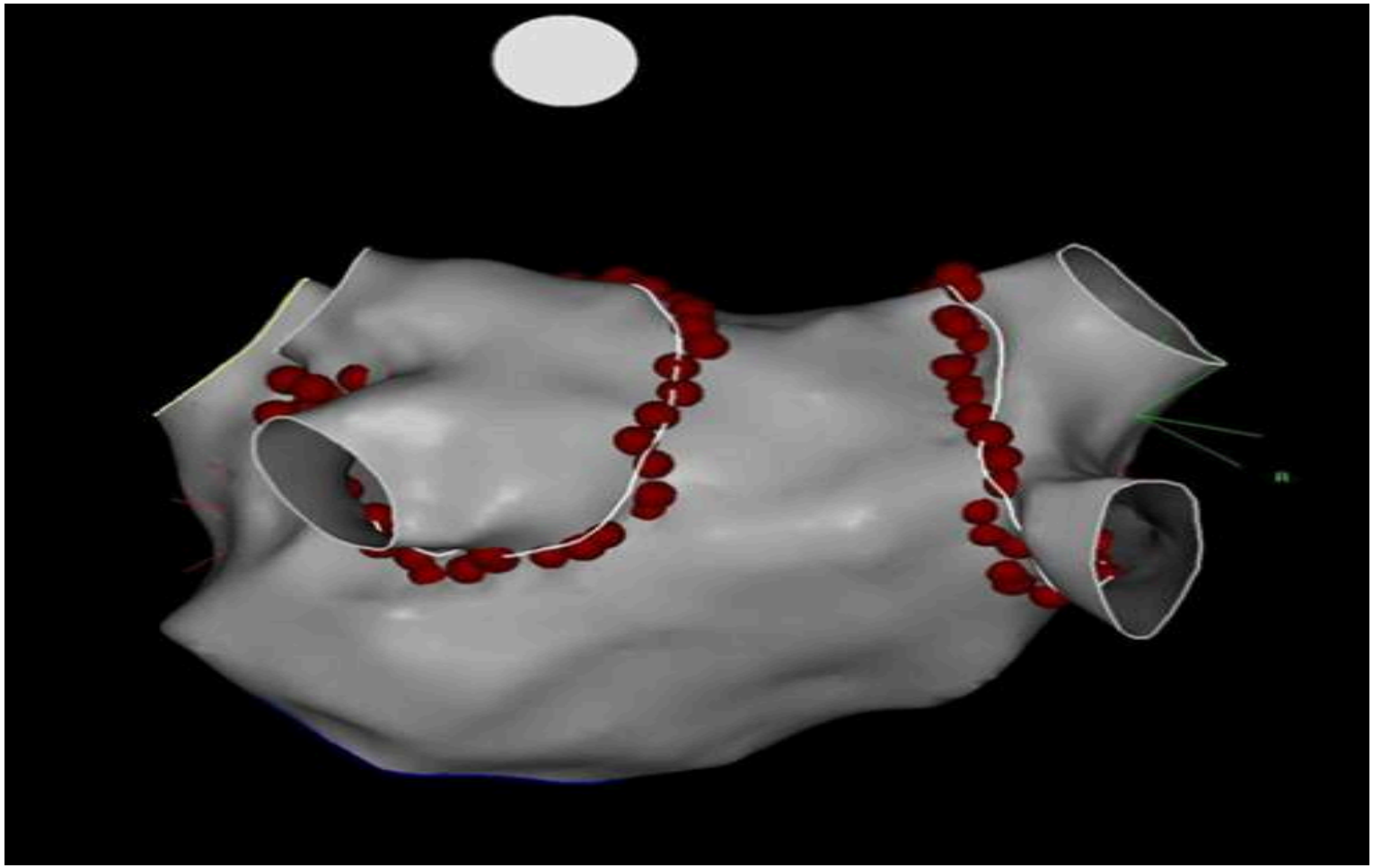
Ouyang et al. Circulation 2004; 110:2090-2096.

Continuous Circular Lesions

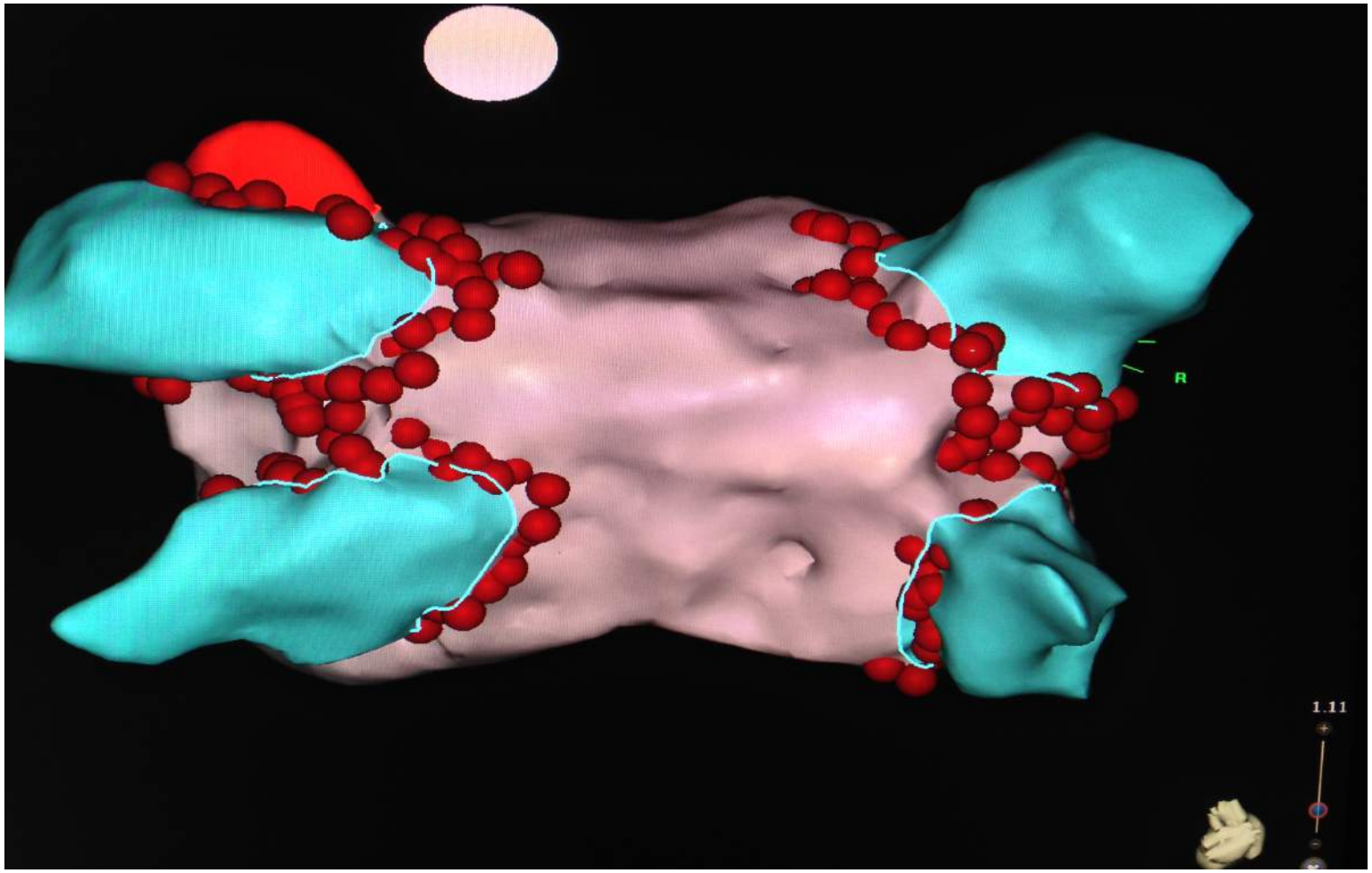
- At 6 month follow up, 31 (76%) patients were free of AF.
- Recurrence of tachyarrhythmia occurred in 10 patients (24%).
  - 9 patients underwent repeated procedures and conduction gaps were found.
  - During a median 131 ± 12 days of follow up, 8 patients were free of AF
- Procedure time was 246 ± 39 minutes with fluoroscopy time of 25.8 ± 10.3 minutes.
- 2 patients with acute pericarditits
- 1 patient with RIPV stenosis
- Isolation of PVs and PV-LA junctions is important in preventing the initiation and maintenance of PAF.

Ouyang et al. Circulation 2004; 110:2090-2096.

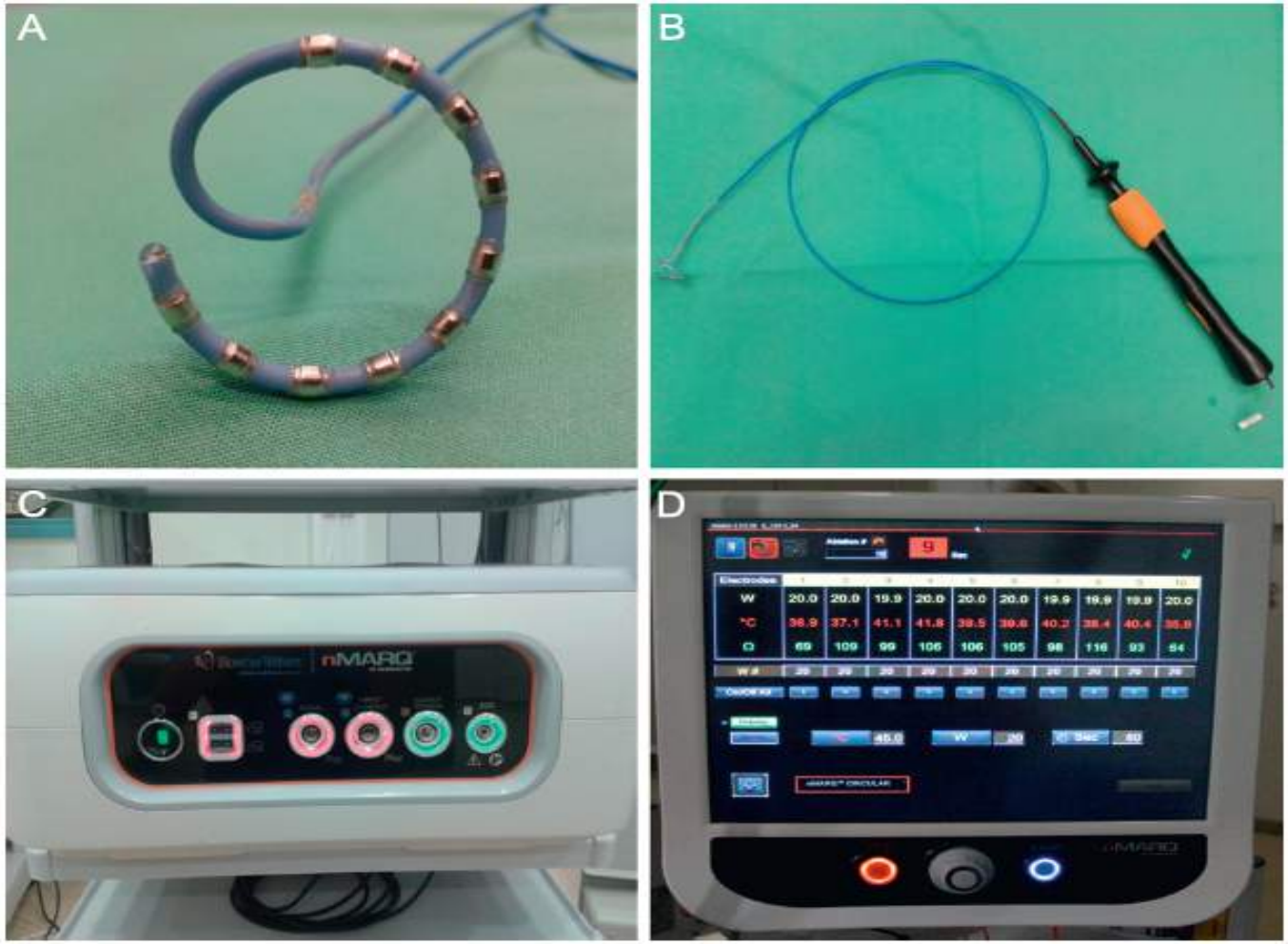
Existing Catheter Isolation of PVs



Existing Catheter Isolation of PVs



Novel Multipolar Irrigated RF Ablation (nMARQ) Catheter



Acute Safety and Efficacy of a Novel Multipolar Irrigated Radiofrequency Ablation Catheter for Pulmonary Vein Isolation

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From the *Heart-Center Bad Neustadt, Clinic for Invasive Electrophysiology, Bad Neustadt, Germany; †Ruhr-University Bochum, Bochum, Germany; and ‡Department of Radiology, Heart and Vascular Clinic Bad Neustadt, Bad Neustadt, Germany

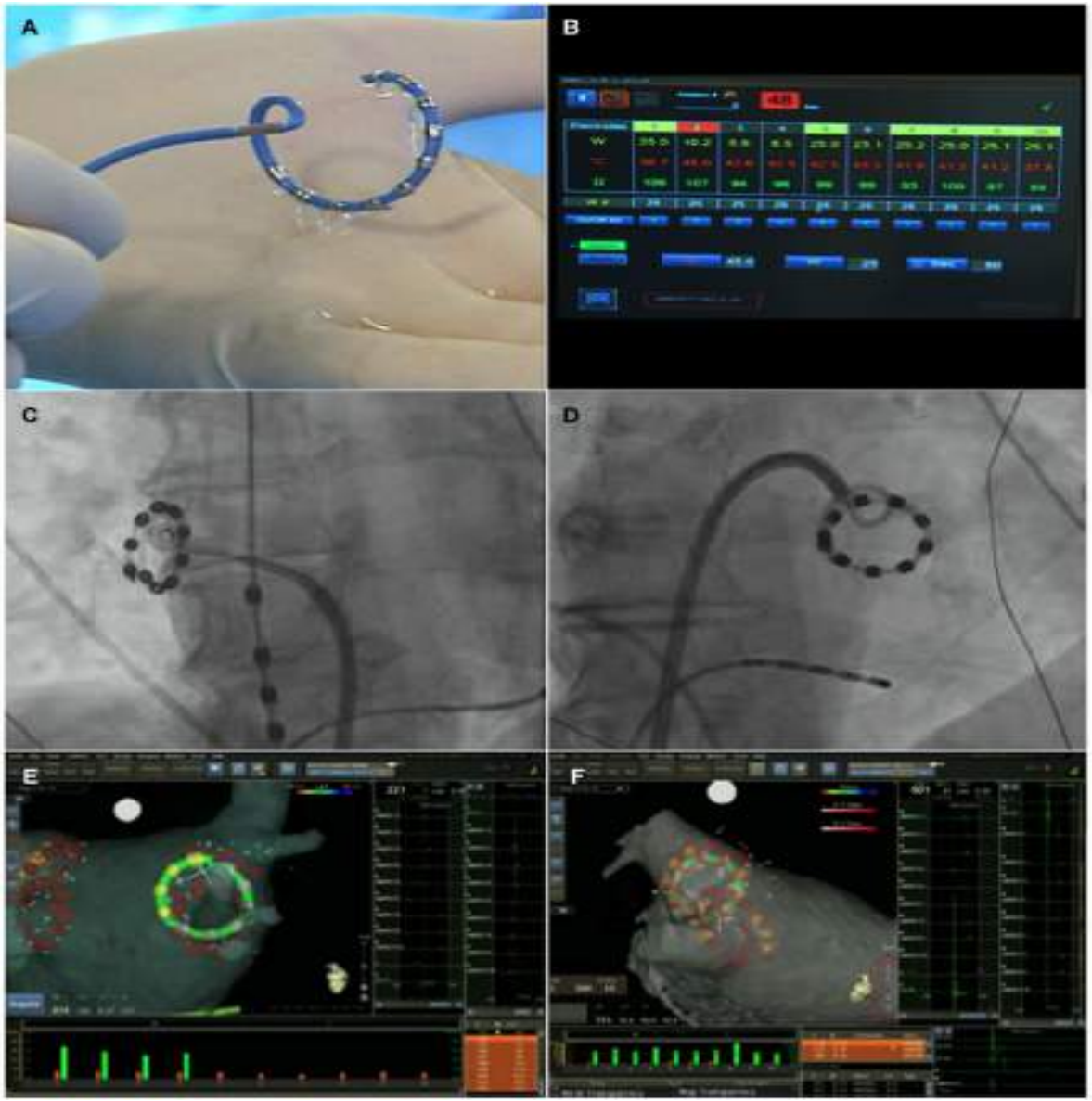
Journal of Cardiovascular Electrophysiology 2014; 25:339-345.

-Using nMARQ catheter with a single trans-septal puncture.

-43 patients with drug symptomatic paroxysmal AF.

-All patients underwent post procedure endoscopy and cerebral MRI

-RF applications were 25 W and 45 °C in unipolar or 15 W and 45 °C for 60 seconds with cool flow at 60 cc/minute



Deneke et al. JCE 2014; 25:339-345.

TABLE 1

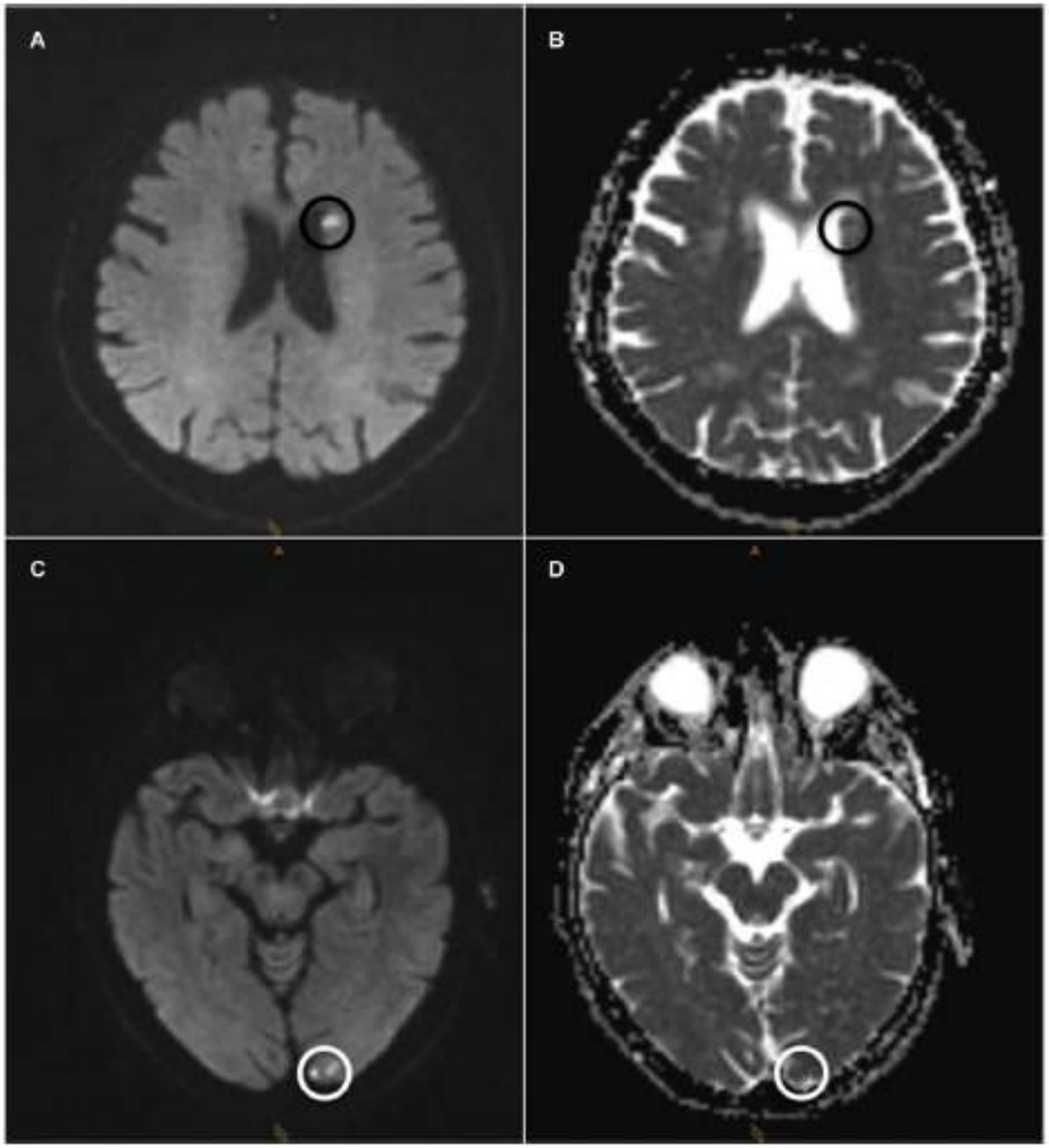
Baseline, Procedural and Acute Outcome of Patients

Total Number of Patients	N = 43	Range
Age (years)	64 (12)	51–78
Ejection fraction (%)	62 (9)	45–70
Paroxysmal	28 (65%)	
Female	17 (40%)	
Left atrial dimensions (mm)	44 (5)	35–55
Ablation on OAC (INR > 2.0)	14 (33%)	
Ablation on NOACs	15 (34%)	
Ablation under bridging	14 (33%)	
INR at day of procedure in OAC patients	2.2 (0.3)	2.0–2.8
Procedure duration (minutes)	133 (41)	90–210
Fluoro time (minutes)	20 (6)	8–37
RF duration (minutes)	19 (7)	7–37
Isol PVs	160 (98%)	
Mean RF (minutes)/Isol PV	4.8 (2)	2.5–9.5
Minimum ACT (seconds)	305 (51)	229–418
Mean ACT (seconds)	334 (78)	304–540
Number of Eso-T-increase >40.5 °C	22 (51%)	
Mean max. Eso temp (°C)	41.6 (0.8)	41.0–43.6
Endoscopic Eso lesions (%)	14 (33%)	
SCL-rate	14 (33%)	
Mean SCL/Pat	1.9	1–8
Mean SCL size (mm)	2.3 (2.0)	1–9

no. = number; ACT = activated clotting time; Isol = isolated; SCL = silent cerebral lesions; Eso = esophageal.

Effective PVI was achieved in 98% of targeted PVs

Deneke et al. JCE 2014; 25:339-345.



Deneke et al. JCE 2014; 25:339-345.

Initial results of using a novel irrigated multielectrode mapping and ablation catheter for pulmonary vein isolation

Dong-In Shin, MD, Kiriakos Kirmanoglou, MD, Christian Eickholt, MD, Jan Schmidt, MD, Lukas Clasen, MD, Britta Butzbach, MD, Tienush Rassaf, MD, Marc Merx, MD, Malte Kelm, MD, Christian Meyer, MD

From the Division of Cardiology, Pulmology and Vascular Medicine, University Hospital, Duesseldorf, Germany.

Heart Rhythm 2014; 11:375-383.

-Using nMARQ catheter with a single trans-septal puncture.

-25 consecutive patients with drug symptomatic paroxysmal AF.

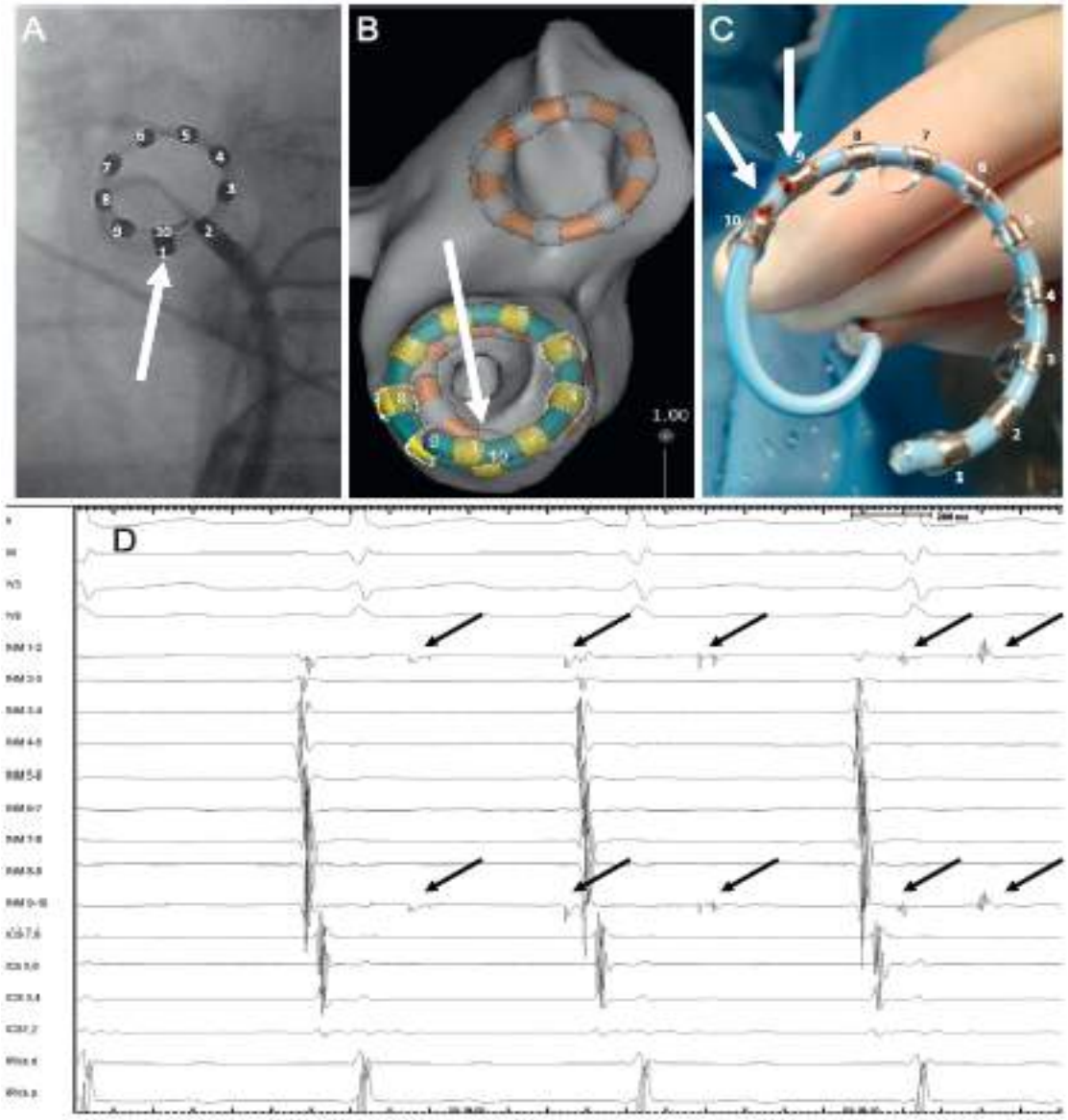
-All patients underwent post procedure cardiac MRI to assess for PV stenosis

-RF applications were 25 W and 45 °C in unipolar or 15 W and 45 °C for 60 seconds with cool flow at 60 cc/minute

Table 2 Procedural and ablation data

A: Procedural data	
Procedure time (min)	110 ± 31
Fluoroscopy time (min)	23 ± 9
Total buming time (min)	15 ± 6
Complications	–
Access site complications	–
Pericardial tamponade	–
TIA/stroke	–
PV stenosis	–
Phrenic nerve palsy	–
Atrioesophageal fistula	–
Death	–
B: Ablation data	
Procedures	25
Total PV	97
Common ostium	3
Successful PV isolation with the nMARQ catheter	97 of 97 (100)
Successful PV intubation with the nMARQ catheter	90 of 97(93)
Mean number of RF applications—total	27 ± 11
Mean number of RF applications—LSPV	9 ± 5
Mean number of RF applications—LIPV	7 ± 5
Mean number of RF applications—RSPV	5 ± 2
Mean number of RF applications—RIPV	5 ± 2
Charring of the nMARQ electrode	3 of 25 (12)

Shin et al. Heart Rhythm 2014; 11:375-383.



Shin et al. Heart Rhythm 2014; 11:375-383.

Table 4 Comparison of procedural data in different ablation technologies used for PVI in treatment of paroxysmal atrial fibrillation

Technology	Acute success (%)	Procedure time (min)	Fluoroscopy time (min)	n
Conventional RF ablation[2]	97.6	165	24	2870
Cryoballoon ablation[2]	97.5	160	34	905
Visually guided laserablation[3]	98.8	200	31	200
PVAC[15]	100	133	30	89
nMARQ catheter	100	110	23	25

Data are presented as mean values.
PVAC = pulmonary vein ablation catheter; PVI = pulmonary vein isolation; RF = radiofrequency.

Shin et al. Heart Rhythm 2014; 11:375-383.

LONG TERM SINGLE CENTER EXPERIENCE OF PAROXYSMAL ATRIAL FIBRILLATION ABLATION PERFORMED WITH THE NMARQ CATHETER

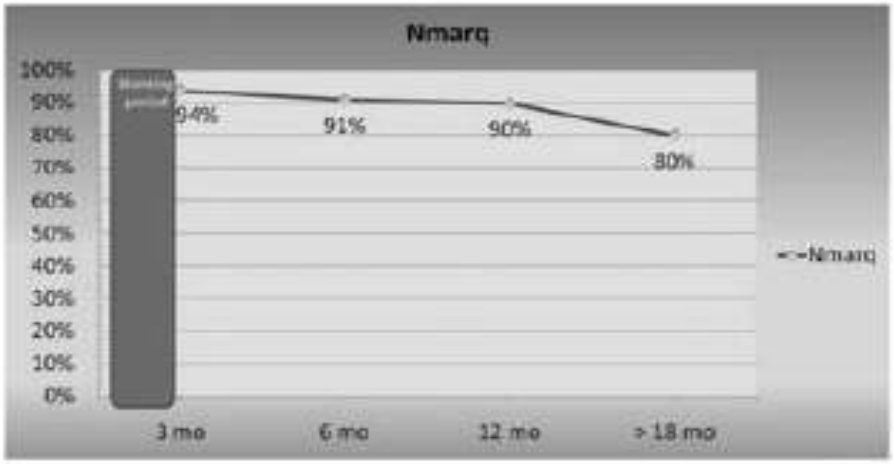
Gaetano M. Fassini, MD, Osama Al-Nono, MD, Stefania Riva, MD, Antonio Dello Russo, MD, PhD, Massimo Moltrasio, MD, Michela Casella, MD, Fabrizio Tundo, MD, PhD, Benedetta Majocchi, MD, Vittoria Marino, MD, Corrado Carbucicchio, MD and Claudio Tondo, MD. Cardiac Arrhythmia Research Centre, Centro Cardiologico Monzino IRCCS, Milan, Italy

Heart Rhythm 2014; 11:S518.

-45 consecutive patients with drug refractory and symptomatic paroxysmal AF.

-RF applications were 25 W and 45 °C in unipolar or 15 W and 45 °C for 60 seconds with cool flow at 60 cc/minute

Success in > 18 mo follow-up



-Procedure time 154 ± 46.7 minute and fluoroscopy time 25.3 ± 9.1 minutes.

-One CVA and no cardiac tamponade.

Fassini et al. Heart Rhythm 2014; 11:S518.

Summary

- PVI is effective in treating drug-resistant and symptomatic PAF.
- PVI is time consuming and technically challenging.
- PVI using nMARQ catheter is fast and effective.
- However, evidence of esophageal injuries and silent cerebral lesions is concerning.
- A phase III trial comparing nMARQ with ThermoCool catheters is enrolling.