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Pulmonary vein reconnection: Is contact force more important than stability?

Lopes N, Adragão P, Costa F, Cavaco D, Carmo P, Parreira L, Santos P, Carvalho M, Teixeira T, Soares A, Abecasis M.

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Hospital da Luz
Hospital Santa Cruz

Acute and Long-Term Clinical Outcome After Endoscopic Pulmonary Vein Isolation: Results from the First Prospective, Multicenter Study

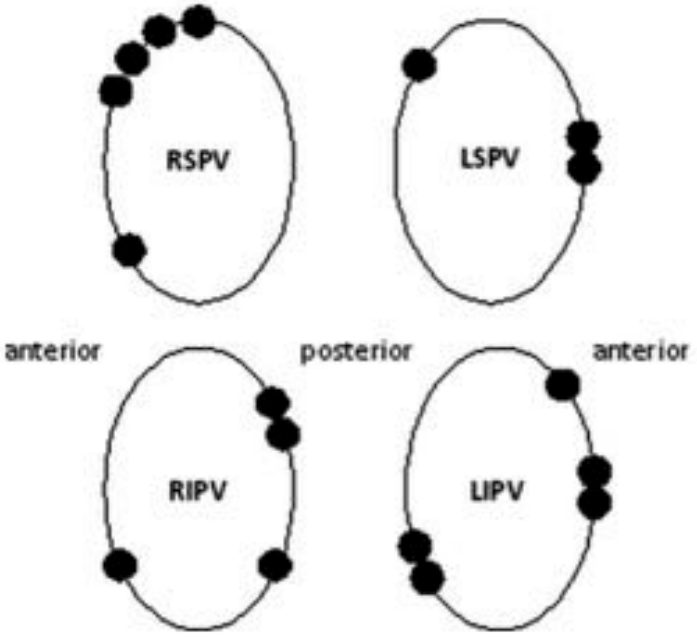
ANDREAS METZNER, M.D.,* ERIK WISSNER, M.D.,* BORIS SCHMIDT, M.D.,† JULIAN CHUN, M.D.,† GERHARD HINDRICKS, M.D.,‡ CHRISTOPHER PIORKOWSKI,‡ FEIFAN OUYANG, M.D.,*† and KARL-HEINZ KUCK, M.D.*

From the *Department of Cardiology, Asklepios Klinik St. Georg, Hamburg, Germany; †Cardioangiologisches Centrum Bethanien, Frankfurt, Germany; and ‡Department of Rhythmology, Heart Center Leipzig, Leipzig, Germany

Left Atrial to Pulmonary Vein Reconnection in Previously Isolated Pulmonary Veins as Assessed During Repeat Procedure

	RSPV	RIPV	LSPV	LIPV	LCPV
Initially isolated PVs, n	11	11	8	10	3
PVs with electrical reconduction, n (%)	8 (73)	6 (55)	7 (88)	7 (70)	2 (67)

LCPV = left common PV; LIPV = left inferior PV; LSPV = left superior PV; PV = pulmonary vein; RCPV = right common PV; RIPV = right inferior PV; RSPV = right superior PV.



Conclusions: **A very high rate of acute electrical PVI is achieved using exclusively the EAS. The 1-year single-procedure success rate in patients with paroxysmal AF is comparable to conventional PVI. PV reconduction is the major determinant for AF recurrence.** *(J Cardiovasc Electrophysiol, Vol. pp. 1-7)*

Journal of Cardiovascular Electrophysiology 2012

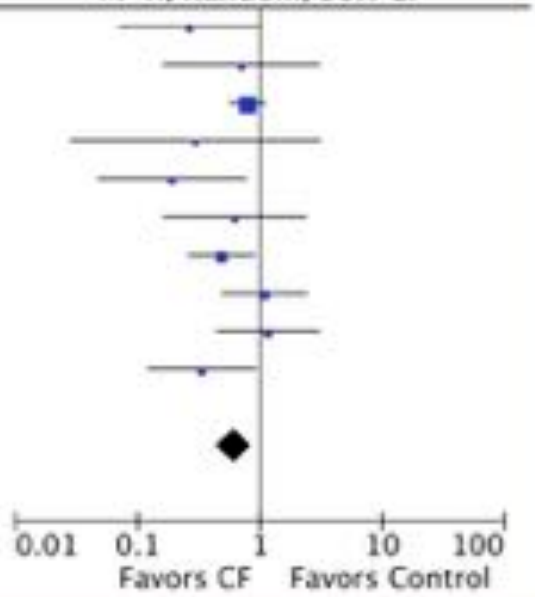
Impact of Contact Force Technology on Atrial Fibrillation Ablation: A Meta-Analysis

Mohammed Shurrab, MD, MSc; Luigi Di Biase, MD, PhD; David F. Briceno, MD; Anna Kaoutskaia, BSc; Saleem Haj-Yahia, MD; David Newman, MD; Ilan Lashevsky, MD; Hiroshi Nakagawa, MD, PhD; Eugene Crystal, MD

	CF		Control			Odds Ratio	Odds Ratio
Study or Subgroup	Events	Total	Events	Total	Weight	M-H, Random, 95% CI	M-H, Random, 95% CI
Andrade	3	25	17	50	5.3%	0.26 [0.07, 1.01]	
Casella	3	20	7	35	4.5%	0.71 [0.16, 3.10]	
Jarman	100	200	223	400	31.5%	0.79 [0.56, 1.12]	
Kimura	1	19	3	19	1.9%	0.30 [0.03, 3.14]	
Marijon	3	30	11	30	4.9%	0.19 [0.05, 0.78]	
Sciarra	5	21	7	21	5.3%	0.63 [0.16, 2.42]	
Sigmund	20	99	34	99	16.9%	0.48 [0.25, 0.92]	
Ullah	32	50	31	50	12.2%	1.09 [0.48, 2.45]	
Wakili	13	32	13	35	9.1%	1.16 [0.43, 3.10]	
Wutzler	5	31	41	112	8.4%	0.33 [0.12, 0.93]	
Total (95% CI)		**527**		**851**	**100.0%**	**0.62 [0.45, 0.86]**	
Total events	185		387				

Heterogeneity: $Tau^2 = 0.06$; $Chi^2 = 11.66$, df = 9 (P = 0.23); $I^2 = 23\%$

Test for overall effect: Z = 2.85 (P = 0.004)

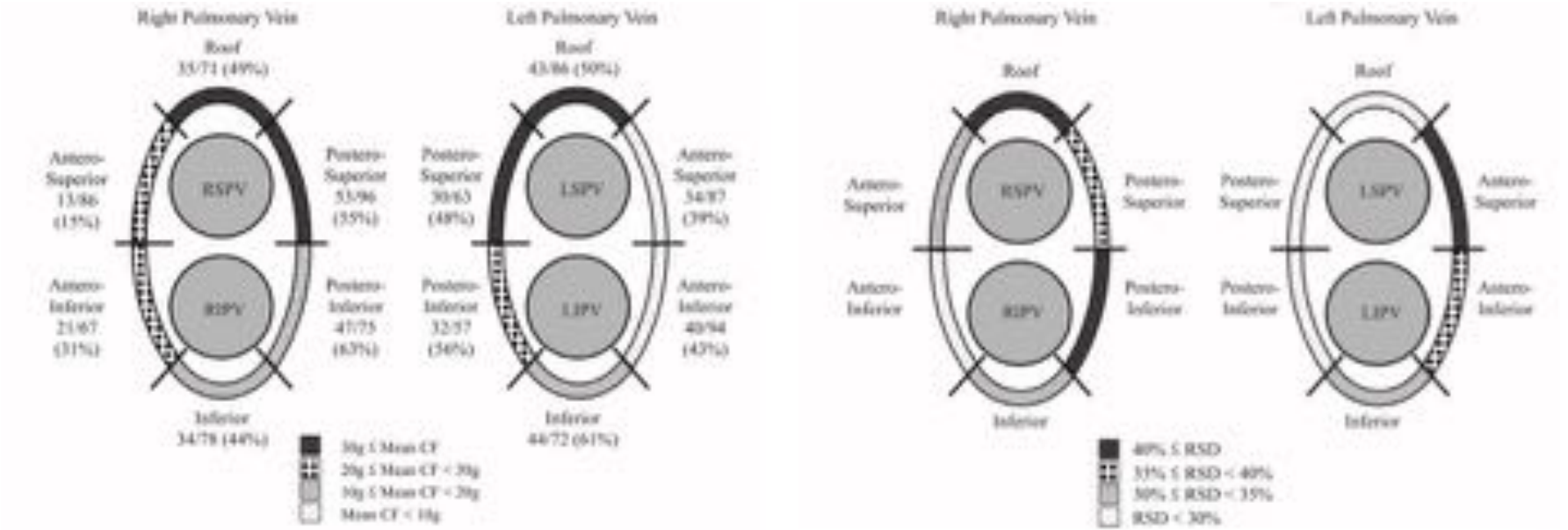


Conclusions—The use of CF technology results in significant reduction of the atrial fibrillation recurrence rate after atrial fibrillation ablation in comparison to the conventional catheter group. CF technology is able to significantly reduce procedure and fluoroscopic times without compromising complication rate. **(*J Am Heart Assoc.* 2015;4:e002476 doi: 10.1161/JAHA.115.002476)**

J Am Heart Assoc. 2015

Incidence and Anatomical Locations of Catheter Instability During Circumferential Pulmonary Vein Isolation Using Contact Force

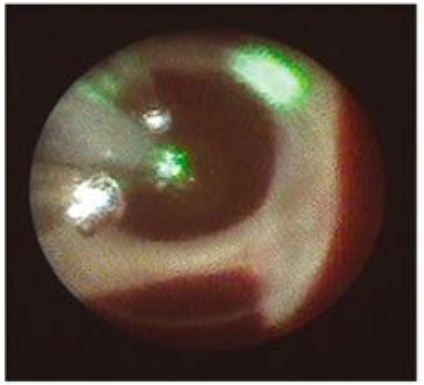
Hisaki MAKIMOTO,[1*] MD, Roland Richard TILZ,[1*] MD, Tina LIN,[1] MD, Andreas RILLIG,[1] MD, Shibu MATHEW,[1] MD, Sebastian DEISS,[1] MD, Erik WISSNER,[1] MD, Andreas METZNER,[1] MD, Peter RAUSCH,[1] MD, Alexander BARDYSZEWSKI,[1] MD, Qingyong ZHANG,[1] MD, Masashi KAMIOKA,[1] MD, Christine LEMEŠ,[1] MD, Karl-Heinz KUCK,[1] MD, *and* Feifan OUYANG,[1] MD



Catheter instability occurred in 45% of ablations during PVI and was predominantly located in the antero-superior segment of the LPV and postero-inferior segment of the RPV, which may result in incomplete lesion formation. RSD had significant correlation with visual catheter stability. (Int Heart J 2014; 55: 249-255)

Int Heart Journal 2014

PV Reconnection



Acute and Long-Term Clinical Outcome After Endoscopic Pulmonary Vein Isolation: Results from the First Prospective, Multicenter Study

ANDREAS METZNER, M.D.,* ERIK WISSNER, M.D.,* BORIS SCHMIDT, M.D.,† JULIAN CHUN, M.D.,† GERHARD HINDRICKS, M.D.,‡ CHRISTOPHER PIORKOWSKI,‡ FEIFAN OUYANG, M.D.,*,† and KARL-HEINZ KUCK, M.D.*

From the *Department of Cardiology, Asklepios Klinik St. Georg, Hamburg, Germany; †Cardioangiologisches Centrum Bethanien Frankfurt, Germany; and ‡Department of Rhythmology, Heart Center Leipzig, Leipzig, Germany

Clinical Outcome After Endoscopic PVI. *Introduction:* The acute and long-term outcome of pulmonary vein isolation (PVI) using an endoscopic ablation system (EAS) has only been reported in single-center studies. The current prospective, multicenter study assessed the acute and 1-year outcome following PVI using the EAS.

Methods and Results: Seventy-two patients (34 female, mean age 58 ± 10 years) with a history (5 ± 6 years) of drug-refractory paroxysmal atrial fibrillation (AF) were included. Endoscopic PVI was performed in all patients. Follow-up was based on regular telephone interviews, Holter ECG, and transtelephonic ECG recordings. Recurrence was defined as a symptomatic and/or documented AF episode >30 seconds following a blanking period of 3 months. In 72 patients, a total of 281 pulmonary veins (PVs) were targeted and 277/281 (98.6%) PVs were isolated successfully using only the EAS. PV stenosis, thromboembolic events, pericardial effusion, pericardial tamponade, and phrenic nerve palsy occurred in 0 of 72, 0 of 72, 3 of 72 (4.2%), 4 of 72 (5.6%), and in 1 of 72 (1.4%) patients, respectively. Sixty-seven of 72 (93.1%) patients completed a follow-up of 365 days and 42 of 67 (62.7%) patients remained in stable sinus rhythm after a single procedure. A total of 13 of 25 (52%) patients suffering from AF recurrence consented to repeat PVI using conventional radiofrequency energy 221 ± 121 days after the index procedure. LA to PV reconduction was found in 30 of 45 (67%) previously isolated PVs.

Conclusions: A very high rate of acute electrical PVI is achieved using exclusively the EAS. The 1-year single-procedure success rate in patients with paroxysmal AF is comparable to conventional PVI. PV reconduction is the major determinant for AF recurrence. *(J Cardiovasc Electrophysiol, Vol. 24, pp. 7-13, January 2013)*

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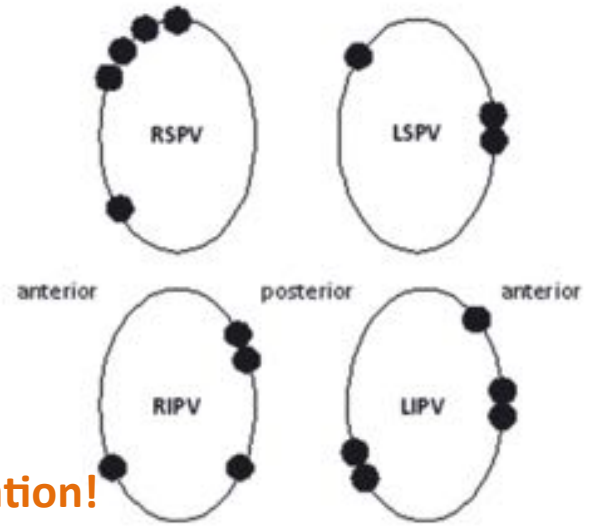


PV reconnection is a main factor for AF recurrence after ablation!

Background

- Pulmonary vein reconnection has been described as a frequent cause for atrial fibrillation recurrence after ablation.

- Contact force catheters have been recently developed and radiofrequency delivery with over 10gr of force related to improved outcomes.

- Catheter stability is considered to be an important factor in creating radiofrequency lesions.

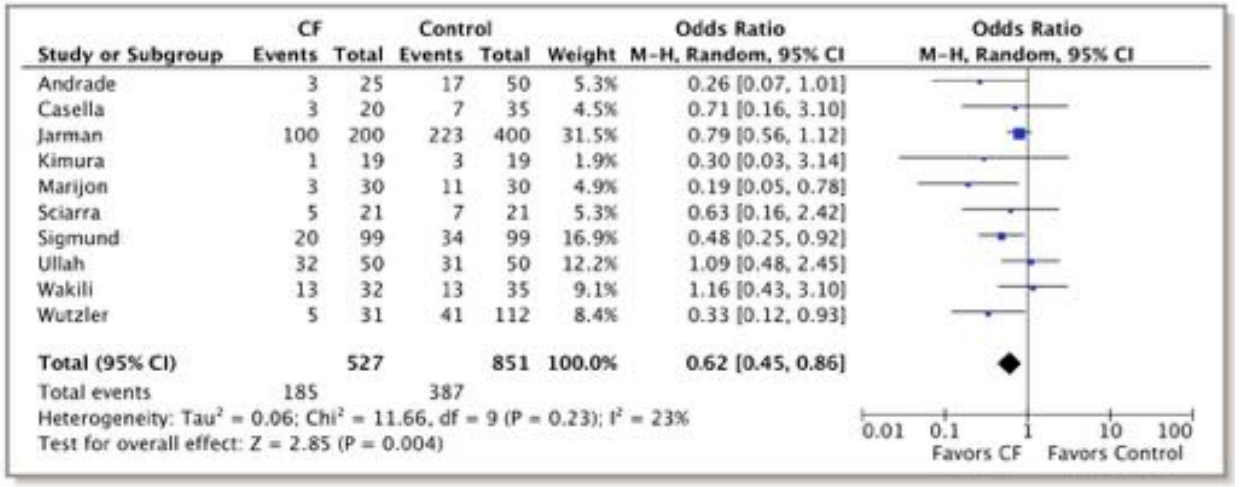
Impact of Contact Force Technology on Atrial Fibrillation Ablation: A Meta-Analysis

Mohammed Shurrab, MD, MSc; Luigi Di Biase, MD, PhD; David F. Briceno, MD; Anna Kaoutskaia, BSc; Saleem Haj-Yahia, MD; David Newman, MD; Ilan Lashevsky, MD; Hiroshi Nakagawa, MD, PhD; Eugene Crystal, MD

Background—Catheter–tissue contact is essential for effective lesion formation, thus there is growing usage of contact force (CF) technology in atrial fibrillation ablation. We conducted a meta-analysis to assess the impact of CF on clinical outcomes and procedural parameters in comparison to conventional catheter for atrial fibrillation ablation.

Methods and Results—An electronic search was performed using major databases. Outcomes of interest were recurrence rate, major complications, total procedure, and fluoroscopic times. Continuous variables were reported as standardized mean difference; odds ratios were reported for dichotomous variables. Eleven studies (2 randomized controlled studies and 9 cohorts) involving 1428 adult patients were identified. CF was deployed in 552 patients. The range of CF used was between 2 to 60 gram-force. The follow-up period ranged between 10 and 53 weeks. In comparing CF and conventional catheter groups, the recurrence rate was lower with CF (35.1% versus 45.5%, odds ratio 0.62 [95% CI 0.45–0.86], P=0.004). Shorter procedure and fluoroscopic times were achieved with CF (procedure time: 156 versus 173 minutes, standardized mean difference −0.85 [95% CI −1.48 to −0.21], P=0.009; fluoroscopic time: 28 versus 36 minutes, standardized mean difference −0.94 [95% CI −1.66; −0.21], P=0.01). Major complication rate was lower numerically in the CF group but not statistically significant (1.3% versus 1.9%, odds ratio 0.71 [95% CI 0.29–1.73], P=0.45).

Conclusions—The use of CF technology results in significant reduction of the atrial fibrillation recurrence rate after atrial fibrillation ablation in comparison to the conventional catheter group. CF technology is able to significantly reduce procedure and fluoroscopic times without compromising complication rate. **(*J Am Heart Assoc.* 2015;4:e002476 doi: 10.1161/JAHA.115.002476)**



Study or Subgroup	CF Events	CF Total	Control Events	Control Total	Weight	Odds Ratio M-H, Random, 95% CI
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Test for overall effect: $Z = 2.85$ ($P = 0.004$)

Odds Ratio M-H, Random, 95% CI
0.01 0.1 1 10 100
Favors CF Favors Control

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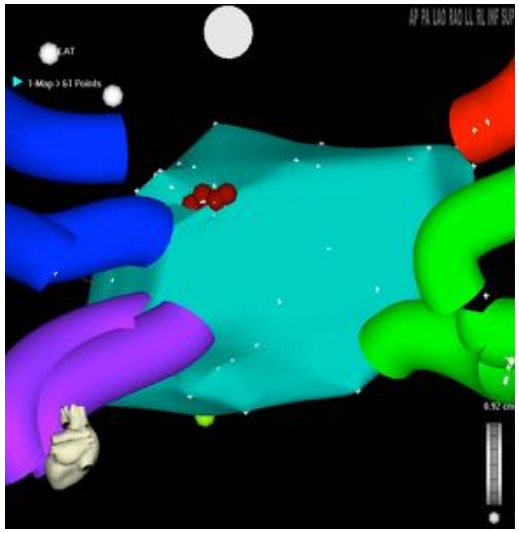
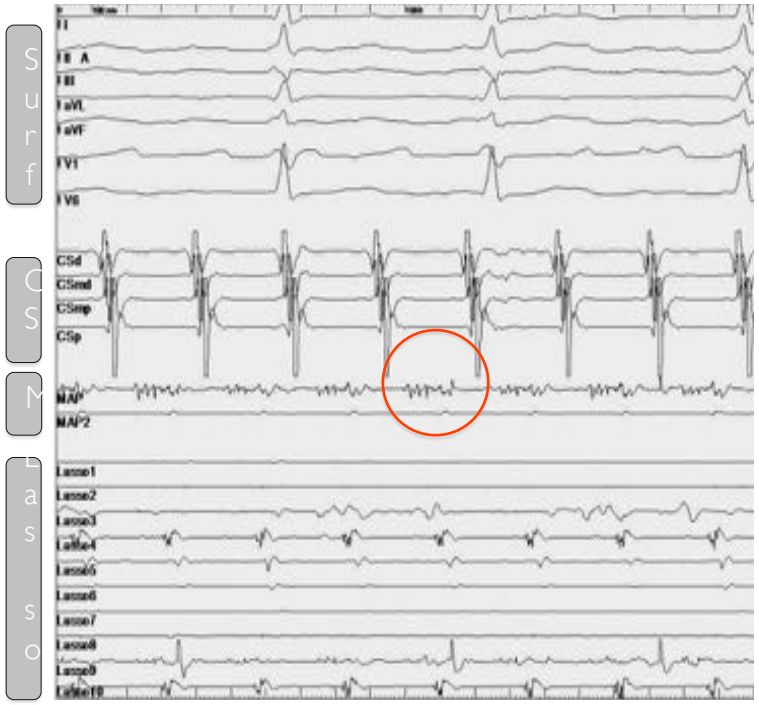
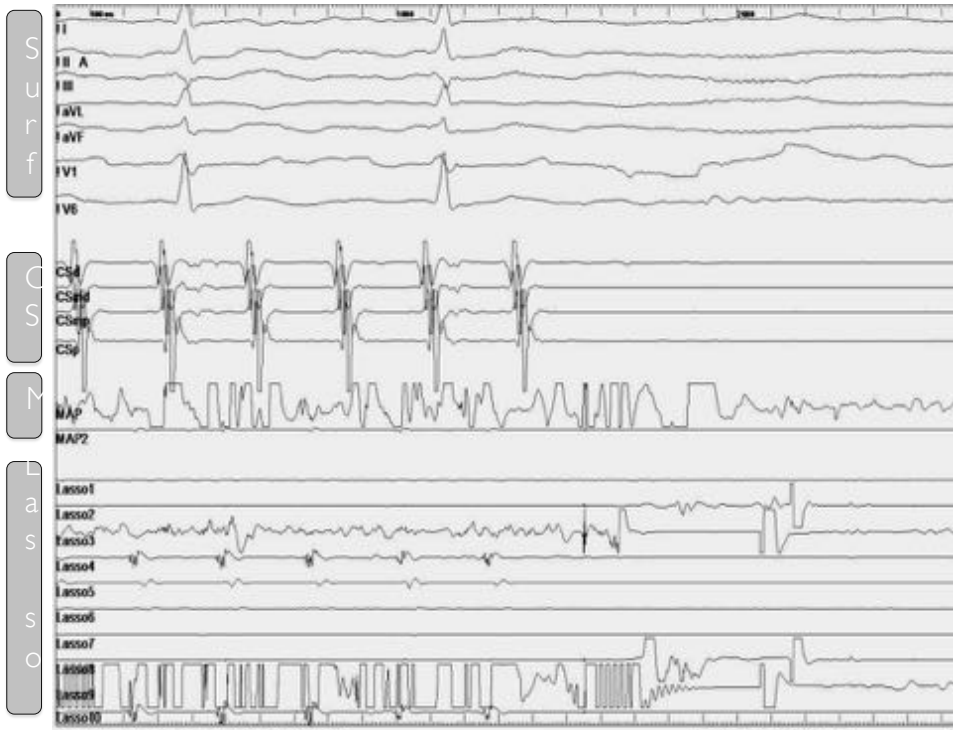


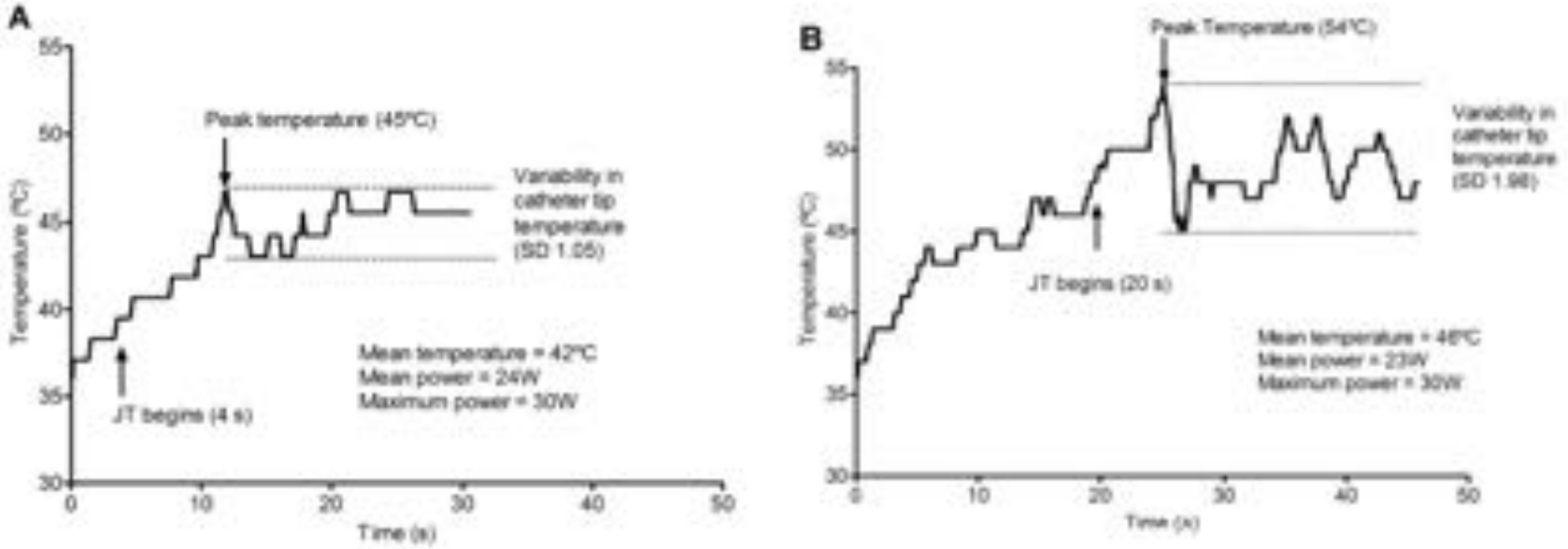
Post Ablation tachycardia very often depends on a small gap in PV isolation





Remote Magnetic Navigation-Assisted Catheter Ablation Enhances Catheter Stability and Ablation Success with Lower Catheter Temperatures

DARRYL R. DAVIS, M.D., ANTHONY S.L. TANG, M.D., MICHAEL H. GOLLOB, M.D., ROBERT LEMERY, M.D., MARTIN S. GREEN, M.D., and DAVID H. BIRNIE, M.D.
From the Department of Cardiology, University of Ottawa Heart Institute, Ottawa, Ontario, Canada



Conclusions: *Although the construction of the ablation catheters is similar, ablations with RMN catheters resulted in a lower mean temperature, earlier time to JT, and less variability of temperature during ablation, suggesting greater catheter stability. This study indicates that ablation with RMN can achieve success with lower catheter temperatures. (PACE 2008; 31:893–898)*

Aim

The aim of our study was to compare pulmonary vein reconnection rate after pulmonary vein isolation with magnetic navigation (Stereotaxis®, contact force under 8 gr and high catheter stability) with manual catheter (higher pressure, lower stability).

Atrial fibrillation ablation using magnetic navigation: comparison with conventional approach during long term follow up

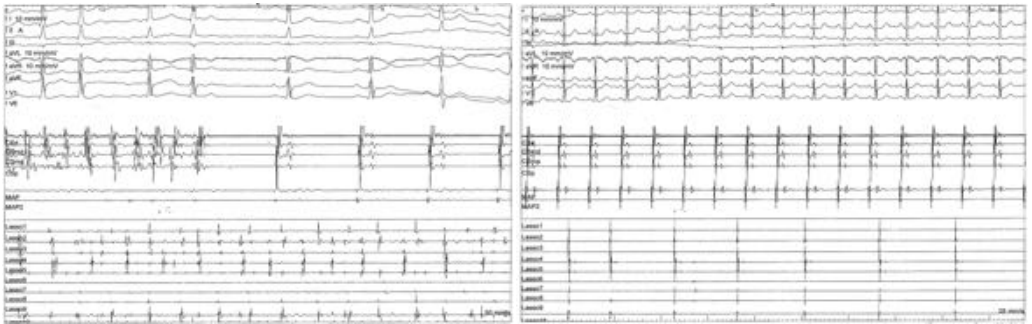
- **1753 consecutive patients** referred for PV isolation in two centers (mean age 57±11 years, 72% male, 36% hypertensive, 70.5% paroxysmal AF).

- One center performing all procedures with remote magnetic navigation (Stereotaxis®) 885 pts and the other with conventional approach (manual) 868 pts.

- 3D mapping system (CARTO® for magnetic navigation and CARTO® or NAV-X ® for manual approach)

- Circular catheter (LASSO®) - Pulmonary vein isolation (stepwise approach)

- Fup (**32.2±21.6 months)** with Holter – 3 month blanking period



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Atrial fibrillation ablation using magnetic navigation: comparison with conventional approach during long term follow up

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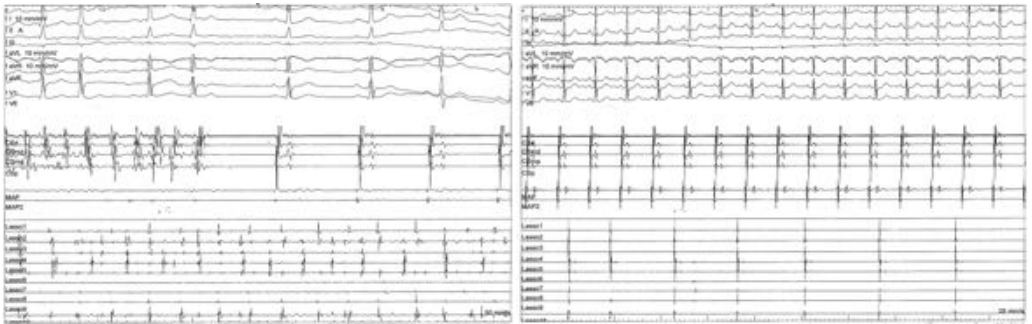
- Two groups were compared:
  - 124 consecutive patients submitted to atrial fibrillation re-ablation with magnetic navigation (14.0% of 885 patients)
  - 125 consecutive patients submitted to re-ablation with manual navigation catheter (14.4% of a series of 868 patients).

- Pulmonary vein reconnection rates were analyzed and the most common veins to recur were described.



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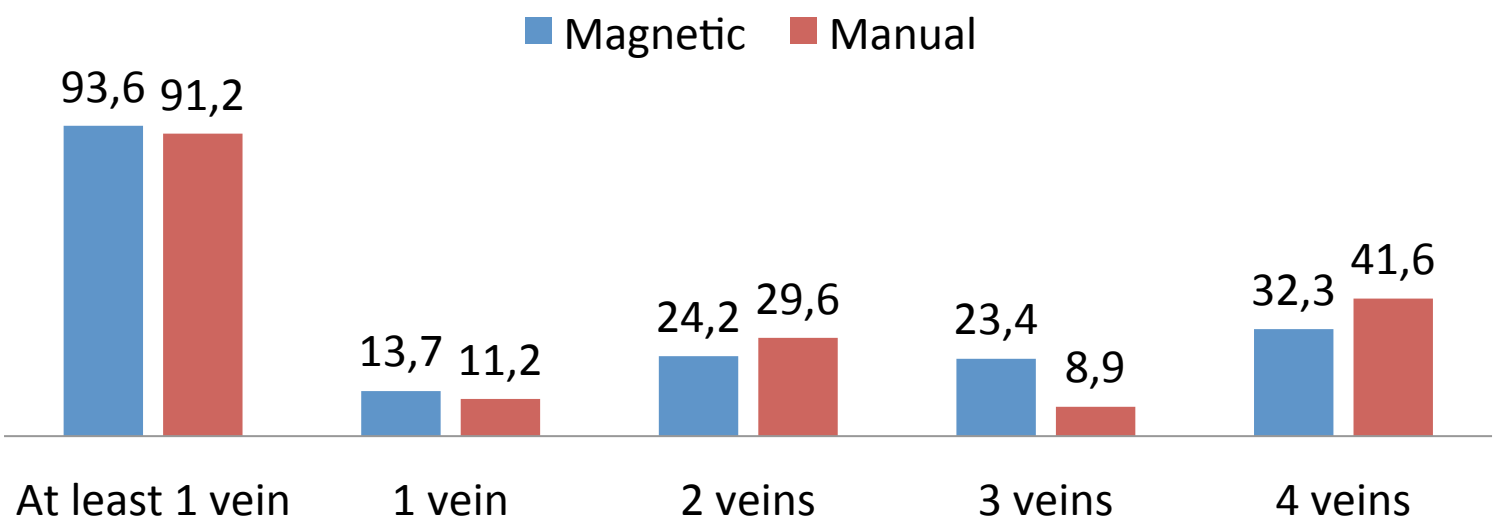
Baseline Data

	Manual n=125	Magnetic n= 124	p
Age (years)	56.58± 11	58.4± 11	0.033
Left Atrium Volume (ml)	119±35	91±34	<0.001
Paroxysmal AF (%)	70.6	75.3	0.131
Procedure duration (min)	153.5±58.4	189.3 ±41.3	< 0.001
Fluoroscopy time (min)	28 ±17	15 ±12	< 0.001
More than 1 ablation (%)	12.3	10.2	0.370
Antiarrhythmics (%)	55.3	57.8	NS

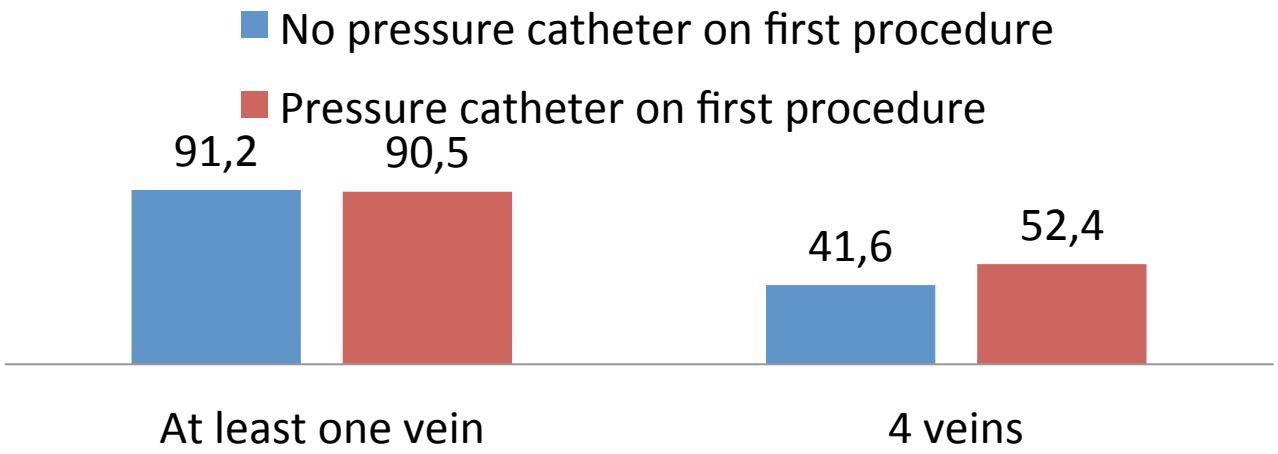
Results – Magnetic vs Manual navigation

Number of reconnected veins	Magnetic (n=124)	Manual (n=125)	p
≥ 1 (at least one vein)	116 (93.6%)	114 (91.2%)	NS
4	40 (32.3%)	52 (41.6%)	NS (p for trend)
3	29 (23.4%)	11 (8.9%)	
2	30 (24.2%)	37 (29.6%)	
1	17 (13.7%)	14 (11.2%)	



Contact Force Catheter influence on reconnected veins

Number of reconnected veins	Manual (n=125)		p
	No contact force catheter on 1st procedure (n=104)	Contact force catheter on 1st procedure (n=21 ; 16.8%)	
≥ 1 (at least one vein)	114 (91.2%)	90.5%	NS
4	52 (41.6%)	52.4%	NS



Results

Reconnection by pulmonary vein was similar in both groups (magnetic and manual):

- The commonest reconnected vein was the right superior (75.8% vs 72.8%)
- Second most common was the right inferior (65.3% vs 71.2%)
- The left superior vein was reconnected in 61.3% vs 58.3%
- The left inferior in 59.7% vs 60.8% (p=NS)

Conclusions

- The majority of patients submitted to atrial fibrillation re-ablation had more than one reconnected vein.
- We did not observe a significant difference whether the first ablation was performed with magnetic navigation (lower pressure and high stability) or manual navigation catheters.
- In this series, the use of contact force catheter didn't correlate with lower prevalence of reconnected veins.
- Long term efficacy of the radiofrequency lesion depends on an equation with many variables and contact force is only one of them.

Thank You