

ABLAZIONE DELLA FIBRILLAZIONE ATRIALE: HOT NEWS

Versatilità del catetere a doppia energia (PFA + RF) nelle procedure di ablazione

Dott.ssa Sara Poggi
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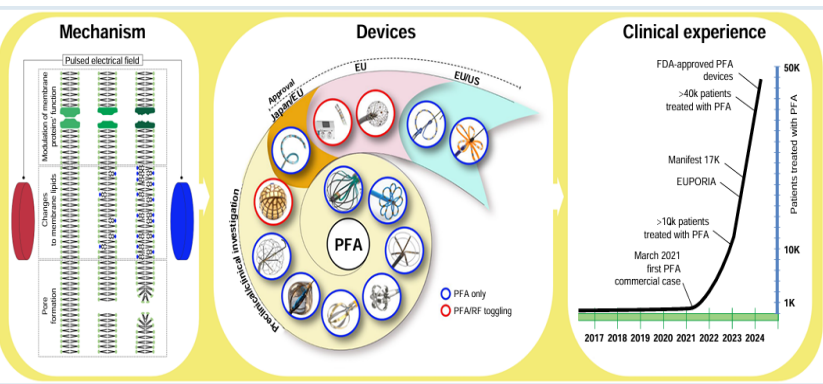


State-of-the-art pulsed field ablation for cardiac arrhythmias: ongoing evolution and future perspective

Kyoung-Ryul Julian Chun ^{1,2,*}, Damijan Miklavčič ³, Konstantinos Vlachos ⁴, Stefano Bordignon ¹, Daniel Scherr ⁵, Pierre Jais ⁴, and Boris Schmidt ¹

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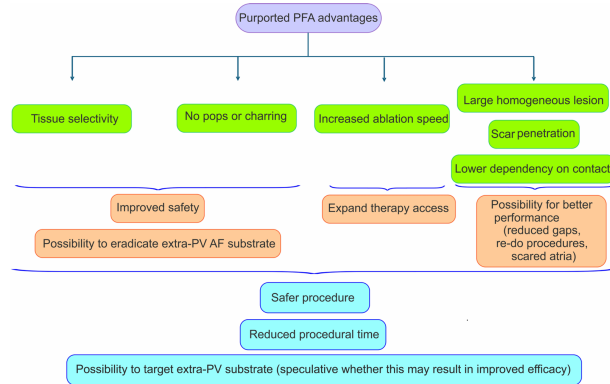
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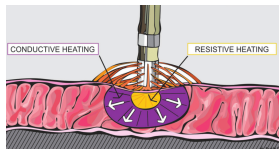


Review

Pulsed Field Ablation of Atrial Fibrillation: A Novel Technology for Safer and Faster Ablation

Alejandro Carta-Bergaz ^{1,2,*}, Gonzalo R. Ríos-Muñoz ^{1,2,3} , Pablo Ávila ^{1,2}, Felipe Atienza ^{1,2,4}, Esteban González-Torrecilla ^{1,2,4} and Ángel Arenal ^{1,2}





RF



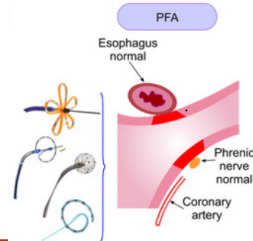
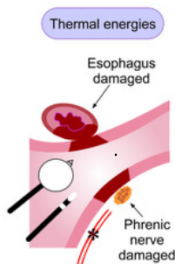
•**Meccanismo:** generazione di energia termica resistiva → coagulative necrosi.

•PRO:

- ✓ Lesioni focali e lineari controllabili.
- ✓ Richiede contatto stabile, forza di contatto e parametri di potenza/durata.
- ✓ Efficace su substrati complessi perché può creare linee e modifiche di substrato.

•CONTRO:

- Rischio di **lesioni termiche collaterali** (esofago, nervo frenico, PV stenosis).
- Dipendenza da esperienza operatore e apprendimento.
- Possibile variabilità nella durabilità dell'
- Fenomeni di "steam pop" e complicanz



PFA

•**Meccanismo:** **elettroporazione irreversibile** mediante campi elettrici pulsati ad alta intensità (non termico).

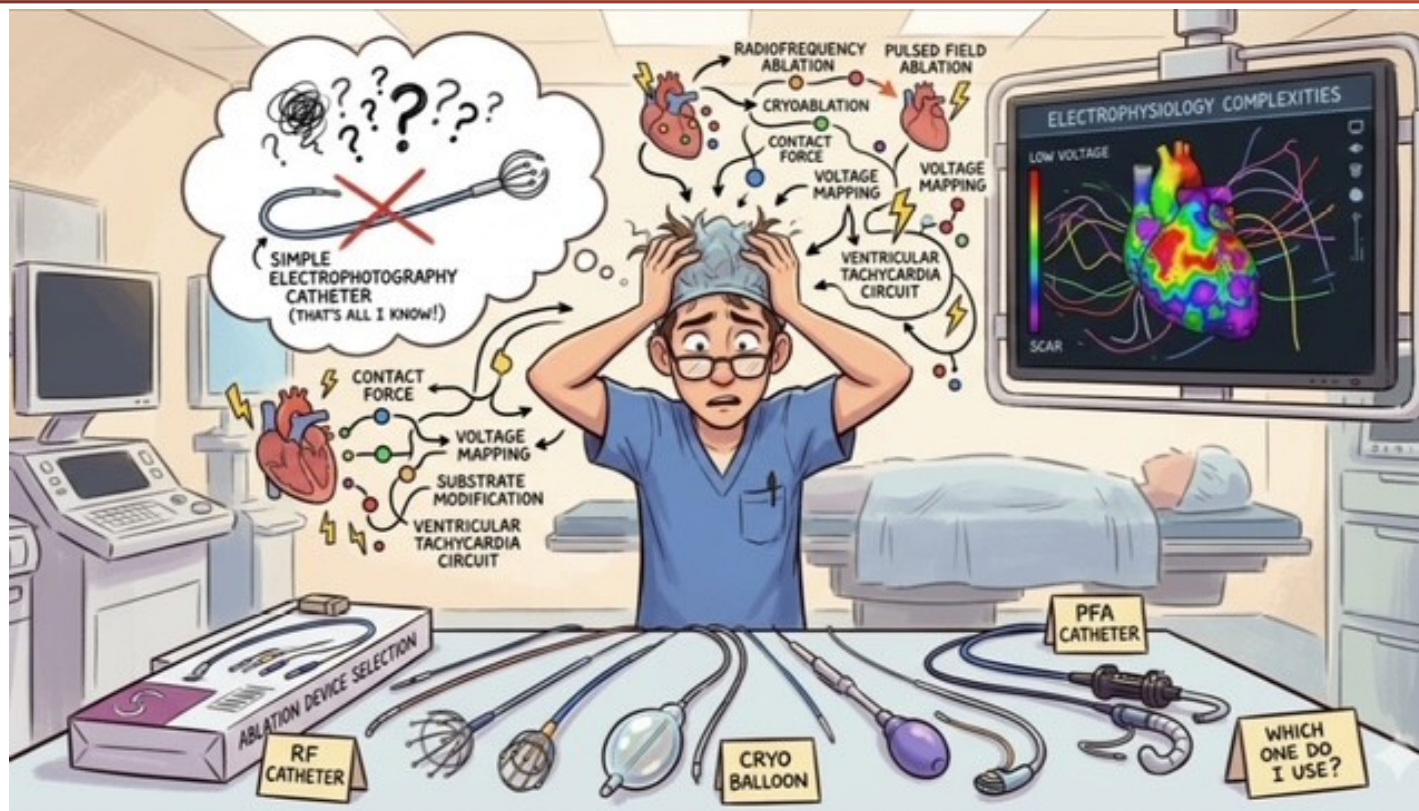
PRO:

- ✓ **Alta selettività tissutale** per miocardio con minimo impatto sulle strutture
- ✓ **Procedure più brevi** e profilo di sicurezza intrinseco più favorevole.
- ✓ **Learning curve bassa** e alta riproducibilità tra centri/operatori diversi
- ✓ Penetrazione nella **SCAR**

CONTRO:

- Attualmente focalizzata principalmente su PVI "**single shot**".
- Meno esperienza per lesioni lineari complesse e trattamenti non PV.
- *Dati di lunga durata (>3-5 anni) non ancora consolidati.*
- **Stunning elettrico atriale**
- **Energia non modulabile**
- **Scarsa versatilità su substrati diversi**







Sphere-9™ catheter
Medtronic

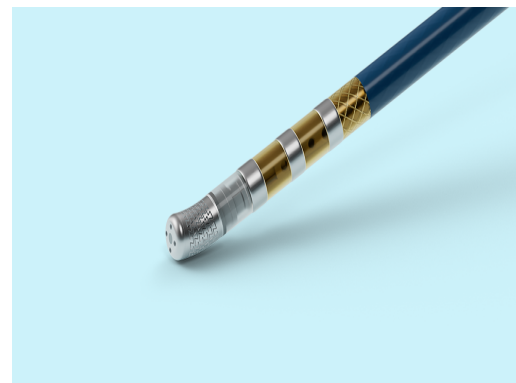
wide-area focal tip and dual-energy ablation capabilities: **RF and PF**

- 4–5 second energy application time
- PF lesions greater than 17 mm wide
- RF lesions greater than 19 mm wide



DUAL ENERGY SMARTTOUCH™ SF Catheter, JnJ

integrated with the CARTO™ 3 System, which combines contact force technology, 3-D mapping and advanced navigation capabilities to provide active measurement of stable contact force and catheter tip location.



TactiFlex™ Duo Ablation Catheter, Sensor Enabled™, Abbott

Seamless EnSite™ X EP System integration with PFA Index (PI) - informed workflow. PI uses real-time tissue response to provide actionable insights on the progression of lesion formation

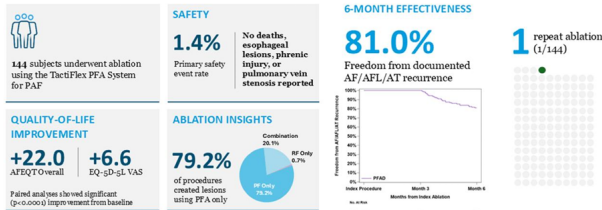


Safety and effectiveness of the TactiFlex duo system: 6-month results of the FOCALFLEX study

Martin Manning ¹, Daniel Scherr ², Alan Bulava ³, Jonathan Kalman ^{3,4}, Prashanthan Sanders ⁵, Paolo Della Bella ⁶, Martin Reinhold Martinek ⁷, Isabel Deisenhofer ⁸, Adrianus P. Wijnmaalen ⁹, Joaquin Osca ¹⁰, Ignacio García Bolao ¹¹, Javier Moreno ^{12,13}, Pierre Jais ^{14,15}, Mads Brix Kronborg ¹⁶, Estelle Gandjbakhch ¹⁷, Helmut Pürerfellner ⁷, Sara Muldoon ¹⁸, Nick Dirckx ¹⁸, Virginia Woods ¹⁸, and John Silberbauer ¹⁹

Graphical Abstract

SAFETY AND EFFECTIVENESS OF TACTIFLEX DUO SYSTEM: 6M RESULTS OF FOCALFLEX STUDY



6-month results support the safety and effectiveness of a novel dual-energy flexible-tip PF-RF catheter to treat symptomatic, recurrent PAF.

Keywords pulsed field ablation • Radiofrequency ablation • Dual energy • Pulmonary vein isolation • Focal catheter

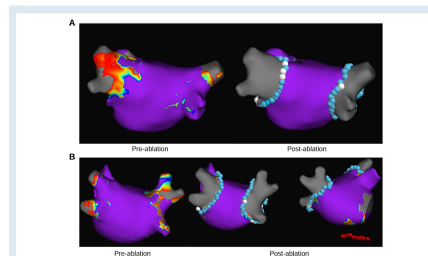


Figure 4 Pre- and post-ablation electroanatomic maps. TactiFlex Duo is integrated with the EdoHe X EP System, with maps depicting the associated AutoMarks after therapy delivery. Blue AutoMarks indicate >10 g of contact was achieved during PFA lesion delivery; white AutoMarks indicate >5 g and <10 g of contact. Figure 4A illustrates a pulmonary vein isolation-only ablation; Figure 4B illustrates PVI with an added cavotricuspid isthmus line created with RF (red AutoMarks).

Table 4 Energy delivery type by location

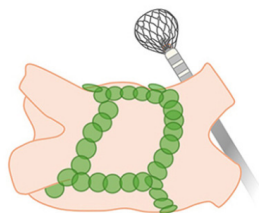
Energy type delivered	PF only	PF + RF ^a	RF only	Number treated (n = 144)
LSPV ^b	94.4% (136/144)	4.9% (7/144)	0.7% (1/144)	100.0% (144/144)
LIPV	93.9% (123/131)	4.6% (6/131)	1.5% (2/131)	100.0% (131/131)
RSPV	94.4% (135/143)	4.2% (6/143)	1.4% (2/143)	99.3% (143/144)
RIPV	94.4% (135/143)	4.2% (6/143)	1.4% (2/143)	99.3% (143/144)
Right middle PV	100.0% (6/6)	0.0% (0/6)	0.0% (0/6)	100.0% (6/6)
Roof line	5.6% (8/144)	0.0% (0/144)	0.7% (1/144)	6.3% (9/144)
Posterior wall isolation	8.3% (12/144)	0.0% (0/144)	0.0% (0/144)	8.3% (12/144)
Posterior line	4.2% (6/144)	0.0% (0/144)	0.0% (0/144)	4.2% (6/144)
Mitral isthmus line	0.7% (1/144)	0.0% (0/144)	0.0% (0/144)	0.7% (1/144)
High crista terminalis	0.7% (1/144)	0.0% (0/144)	0.0% (0/144)	0.7% (1/144)
Cavotricuspid isthmus line	0.0% (0/144)	0.0% (0/144)	12.5% (18/144)	12.5% (18/144)
Inferior line	0.0% (0/144)	0.0% (0/144)	0.7% (1/144)	0.7% (1/144)
SVT	0.0% (0/144)	0.0% (0/144)	0.7% (1/144)	0.7% (1/144)

LSPV, left superior pulmonary vein; LIPV, left inferior pulmonary vein; RSPV, right superior pulmonary vein; RIPV, right inferior pulmonary vein; PV, pulmonary vein; SVT, supraventricular tachycardia; PF, pulsed field; PFA, pulsed field ablation; RF, radiofrequency.

^aPF + RF does not indicate stacked lesions.

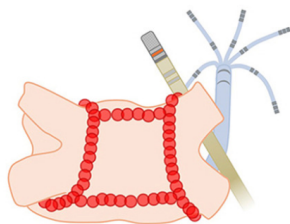
^b13 Left common PVs are included in LSPV.

Impact of linear ablation in persistent atrial fibrillation using a dual-energy, wide-footprint catheter: Analysis from the SPHERE Per-AF Randomized Trial



Investigational arm (N=212)

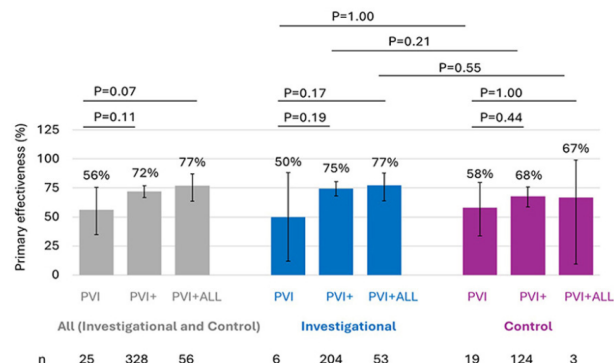
Wide-footprint dual-energy (RF/PF) lattice-tip ablation system



Control arm (N=148)*

Conventional contact force RF ablation system

*patients with electroanatomical mapping files available



Ablation Categories

- PVI = pulmonary vein isolation only
- PVI+ = PVI + any linear lesions
- PVI+ALL = PVI + all linear lesions (i.e., posterior wall, cavo-tricuspid isthmus, & mitral isthmus)

Trend for numerically higher effectiveness with linear lesions vs. PVI alone, using dual-energy lattice-tip mapping and ablation system, is **hypothesis-generating** and warrants further investigation.

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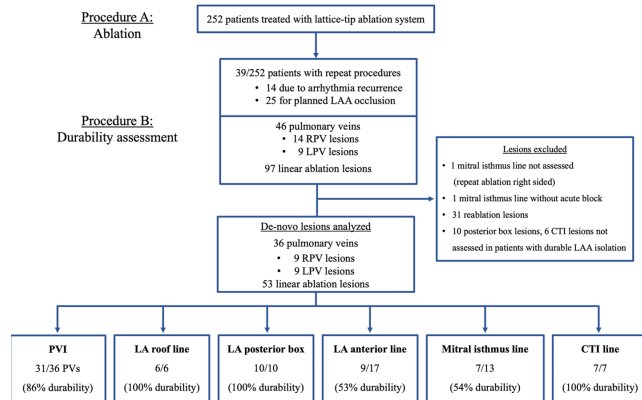
Impact of linear ablation in persistent atrial fibrillation using a dual-energy, wide-footprint catheter: Analysis from the SPHERE Per-AF randomized trial



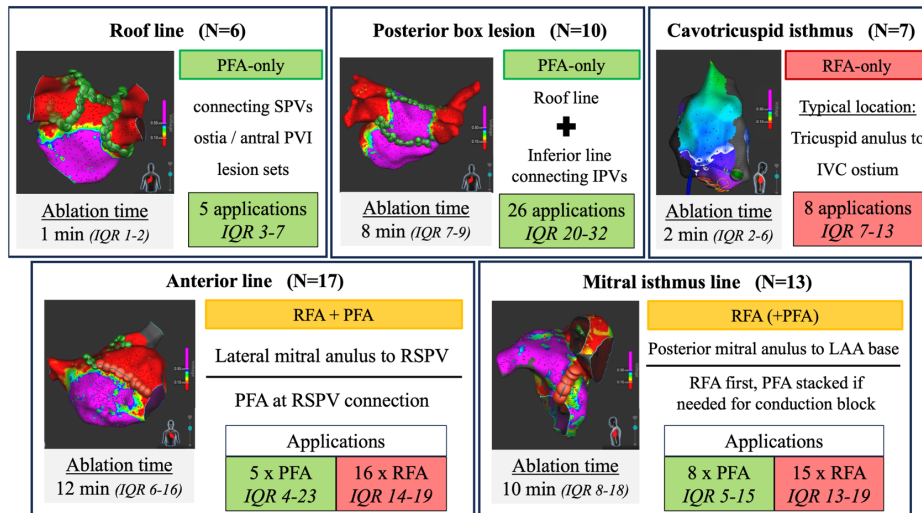
Durability of atrial linear lesion sets using a dual-energy lattice-tip catheter: Data from invasive remapping

Moritz Nies, MD,^{1,2} Maria Luisa Benesch Vidal, MD,¹ Ilaria My, MD, PhD,¹ Marc D. Lemoine, MD,¹ Katharina Govorov, XX,¹ Niklas Schenker, MD,¹ Djemal Ismaili, MD,¹ Johanna Skibowski, XX,¹ Dominik Christmann, MD,¹ Lea Scharlemann, XX,¹ Bruno Reißmann, MD,¹ Feifan Ouyang, MD,¹ Paulus Kirchhof, MD,^{1,2} Andreas Rillig, MD,¹ Andreas Metzner, MD¹

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Versatility : which Energy for which Region?



ORIGINAL ARTICLE

Maximizing Lesion Depth With the Lattice-Tip Catheter: A Preclinical Comparison of Single, Double, and Mixed Pulsed-Field and Radiofrequency Applications

Keita Watanabe¹, MD; Masaya Shinohara², MD; Fengyuan Yu, MD; Vivek Y. Reddy³, MD; Jacob S. Koruth⁴, MD

WHAT IS KNOWN?

- Sequential pulsed field (PF) and radiofrequency ablation using a specific dose with a 3.5-mm focal-tip catheter has been reported to create deeper lesions than single PF or radiofrequency applications.
- Repeated PF applications using the lattice-tip catheter have been shown to create deeper lesions than a single PF application.

WHAT THE STUDY ADDS

- Two consecutive PF applications with the lattice-tip catheter produced the deepest and most uniform lesions with the least variability among all single- or sequential dual-energy strategies.
- Radiofrequency followed by PF resulted in similar depth, but required toggling between settings and risks potential thermal adverse events.

Lesion-to-lesion variation arising from different degrees of tissue-coupling compression and stability can be mitigated by repeating PF applications

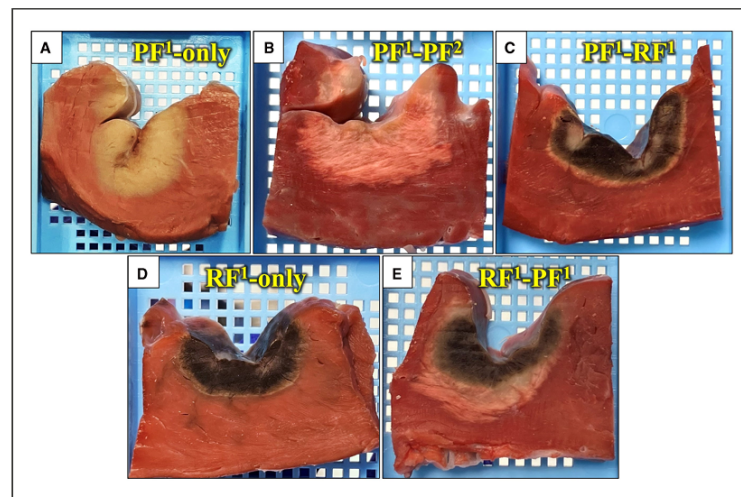


Figure 3. Gross appearance of lesions across ablation settings.

Gross sections of triphenyl tetrazolium chloride-stained ventricular tissue depicting single pulsed-field (PF) ablation lesion (A, PF¹-only), 2 consecutive PF applications (B, PF¹-PF²), PF followed by sequential application of radiofrequency (RF) ablation (C, PF¹-RF¹), RF ablation alone (D, RF¹-only), and RF followed by sequential application of PF (E, RF¹-PF¹).



Association Between Contact Force and Acute Lesion Effectiveness in Focal Pulsed Field Ablation

Sara Poggi^{1,2} | Nandor Szegedi³ | Cheryll Teres⁴ | Daniel Scherr⁵ | Christian Heeger⁶ | Gabor Szeplaki⁷ | Benjamin Berte⁸ | Alexandra Karsai³ | Teresa Strisciuglio⁹ | Giuseppe Stabile¹

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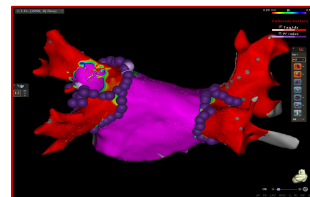
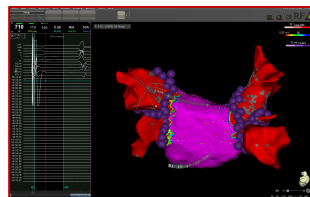
High Density pre and post ablation mapping

Study Analysis

PVI Guided by PFA Index

Anterior: 500

Posterior: 400



PFA points analysis

Successful points

Unsuccessful points

Association Between Contact Force and Acute Lesion Effectiveness in Focal Pulsed Field Ablation

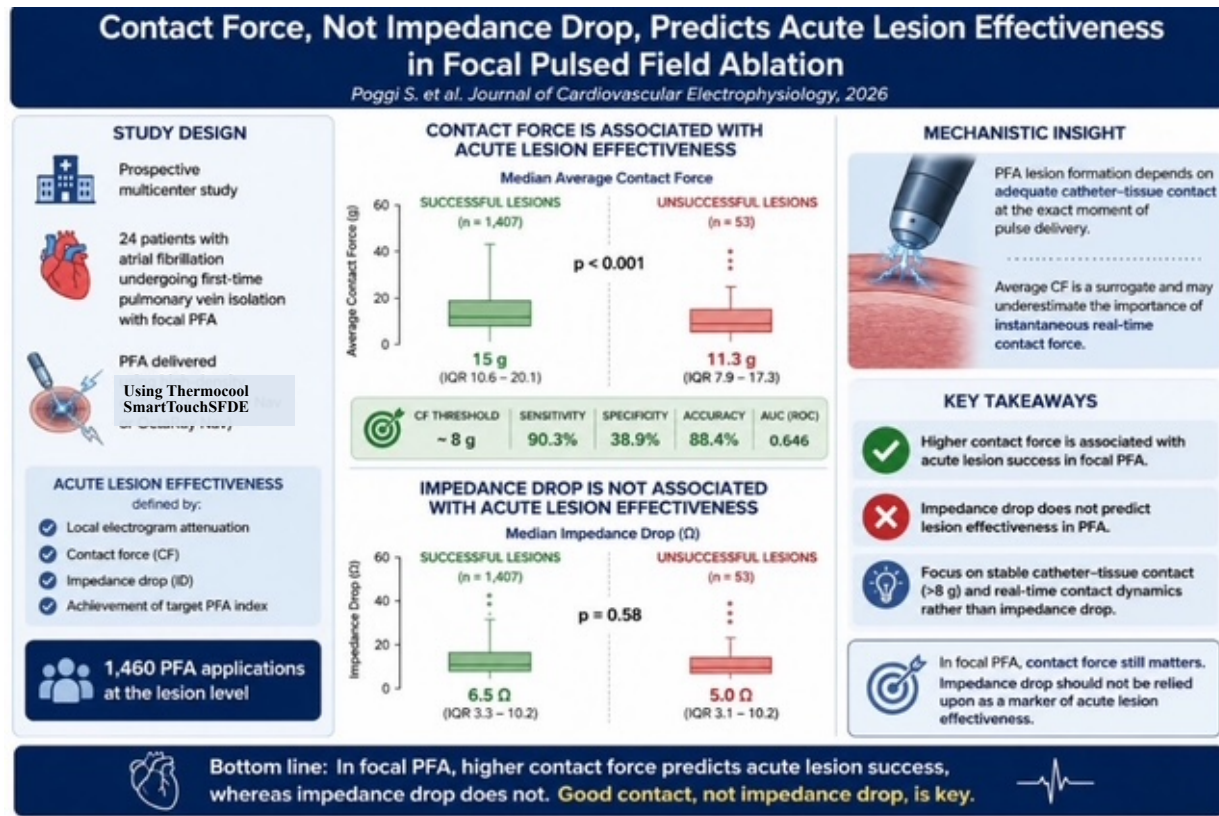
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For each ablation point (both successful/unsuccessful), procedural parameters including :

contact force (CF),
impedance drop (ID),
achievement of the target PFA index

were recorded and analyzed



BRIEF COMMUNICATION OPEN ACCESS

Association Between Contact Force and Acute Lesion Effectiveness in Focal Pulsed Field Ablation

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Diagnostic Accuracy - Average Contact Force (g)

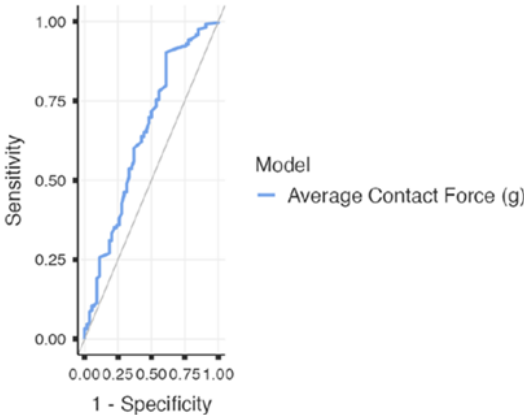
	Result	95% Confidence Interval	
		Lower	Upper
Sensitivity	90.28 %	88.62 %	91.78 %
Specificity	38.89 %	25.92 %	53.12 %
Positive Likelihood Ratio	1.477	1.193	1.829
Negative Likelihood Ratio	0.250	0.173	0.362
Prevalence	96.31 %	95.21 %	97.22 %
Positive Predictive Value	97.47 %	96.89 %	97.95 %
Negative Predictive Value	13.29 %	9.57 %	18.17 %
Accuracy	88.39 %	86.64 %	89.98 %

Average Contact Force (g)

Contingency Table - Average Contact Force (g)

		point of success		Total
		yes	no	
Average Contact Force (g)	≥8.01	1273	33	1306
	<8.01	137	21	158
Total		1410	54	1464

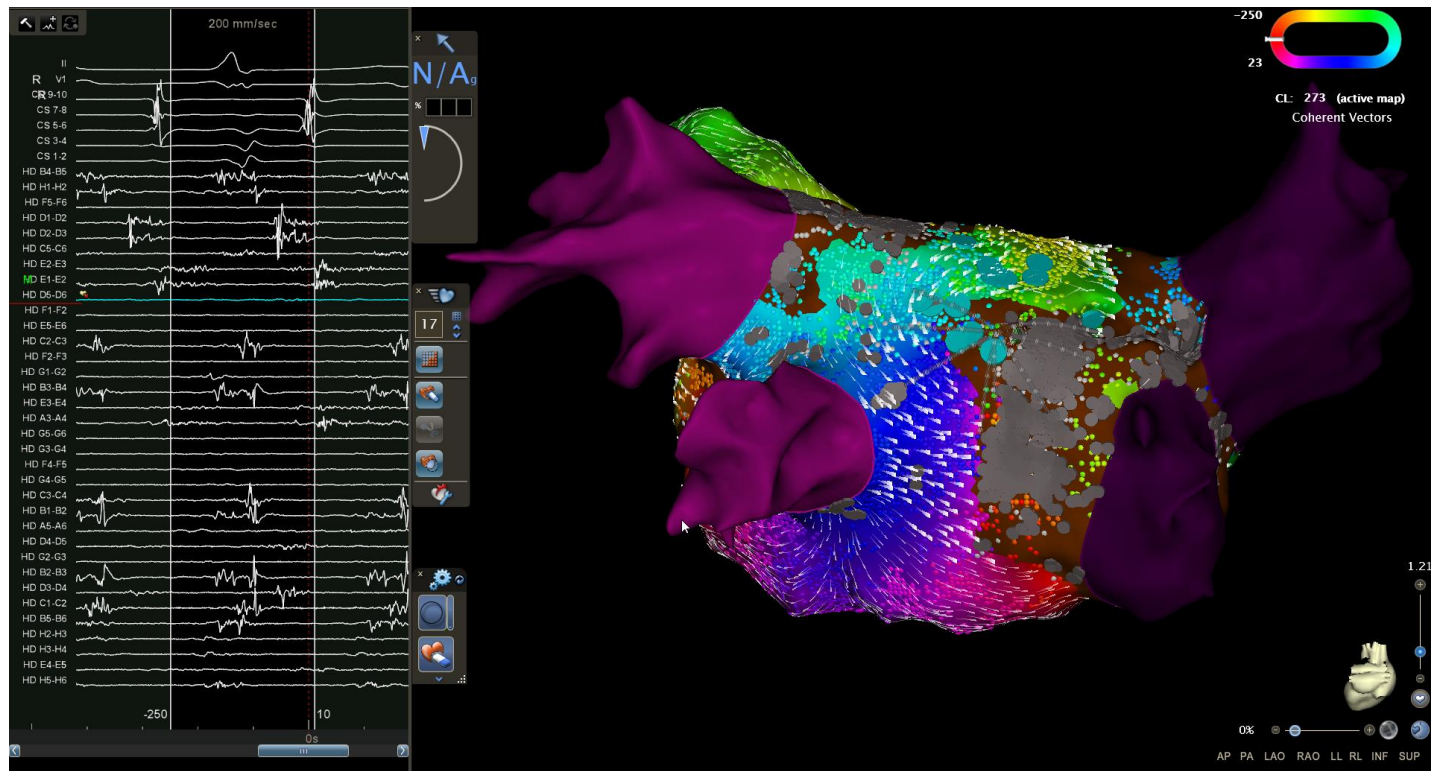
Nota. Based on optimal cut-off (Youden's Index)

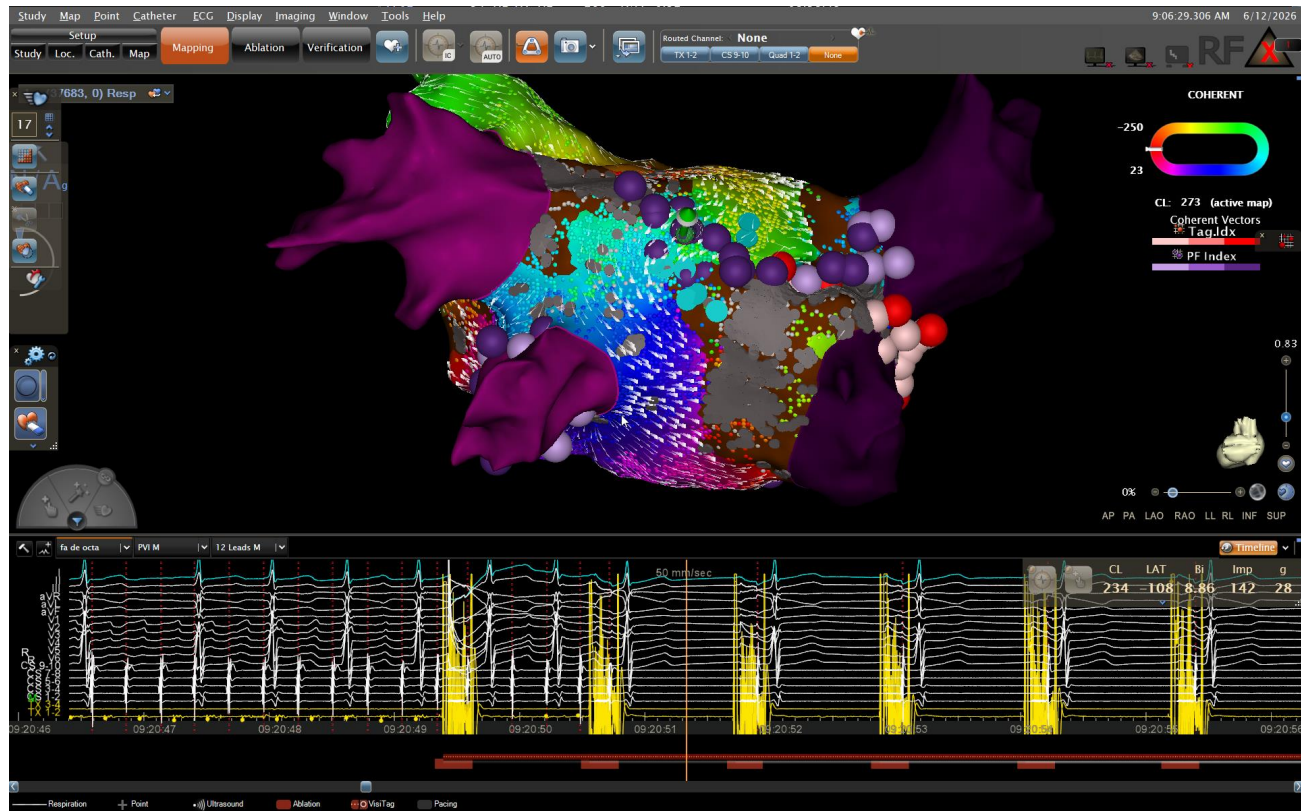


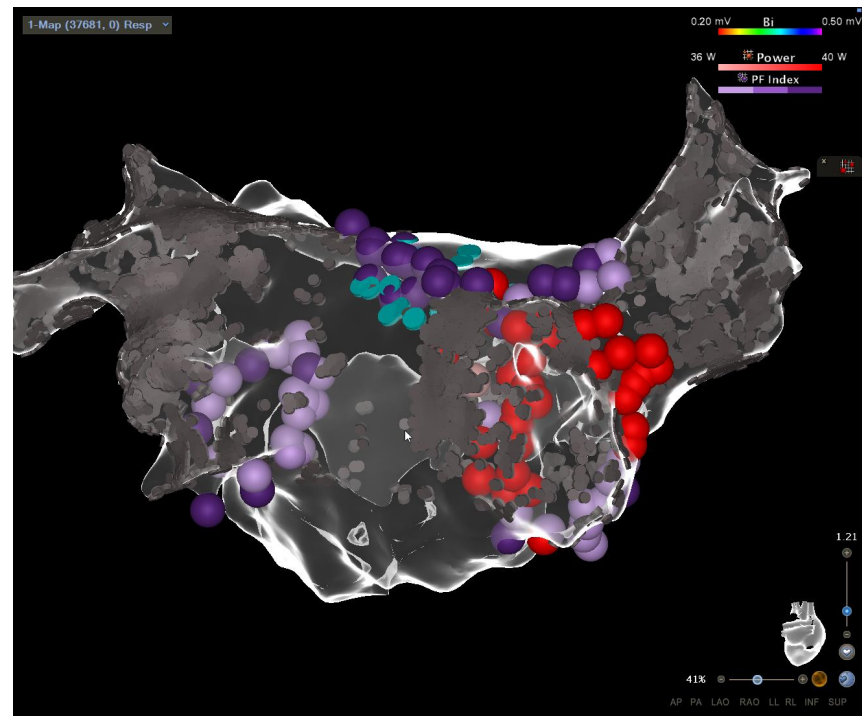
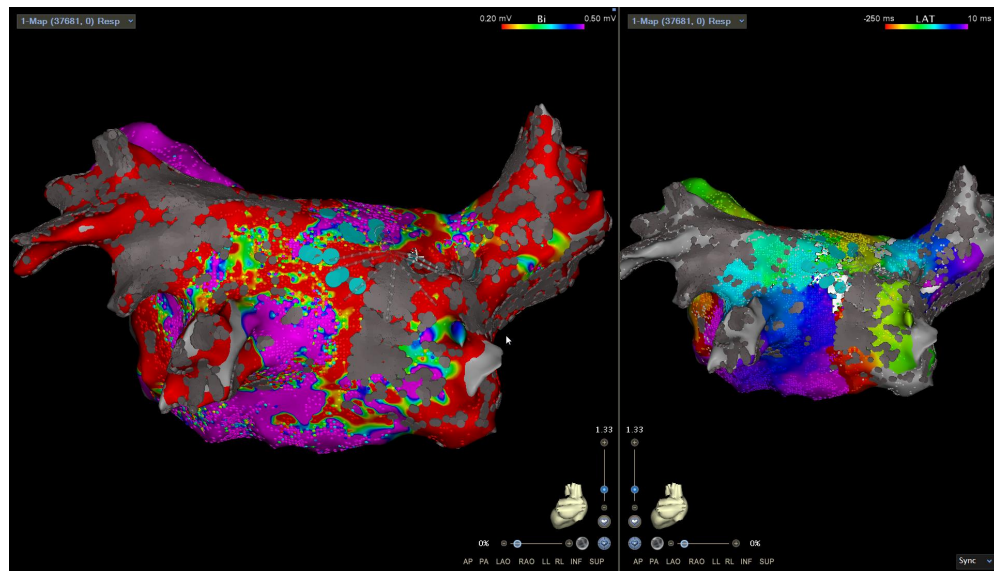
ROC Curve Summary

	AUC	Std. Error	95% Confidence Interval		p
			Lower	Upper	
Average Contact Force (g)	0.646	0.0424	0.563	0.729	<.001

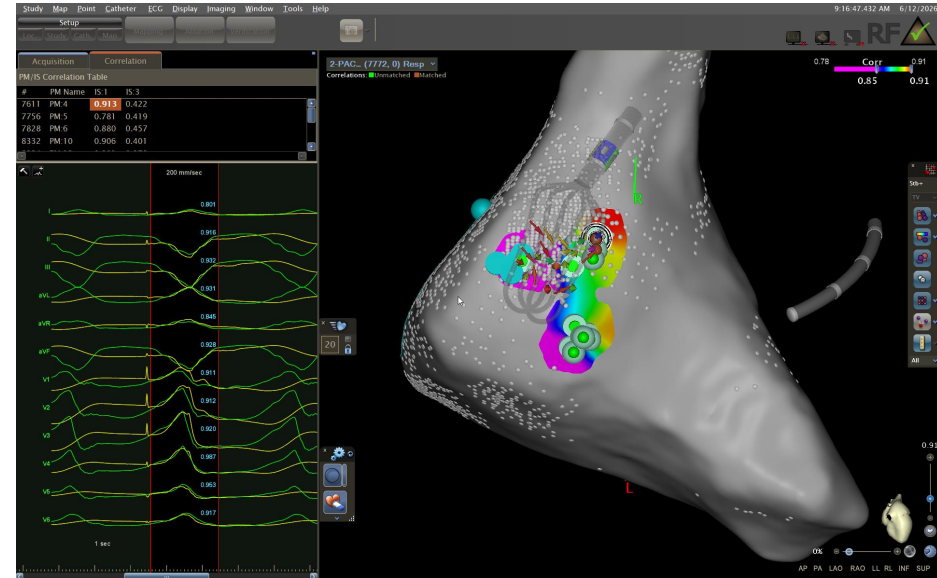
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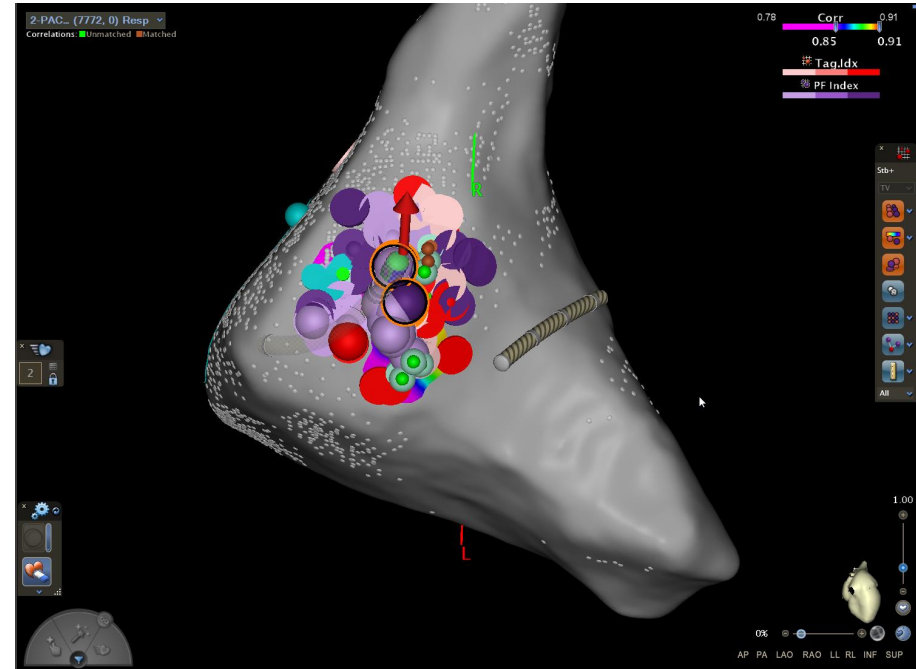
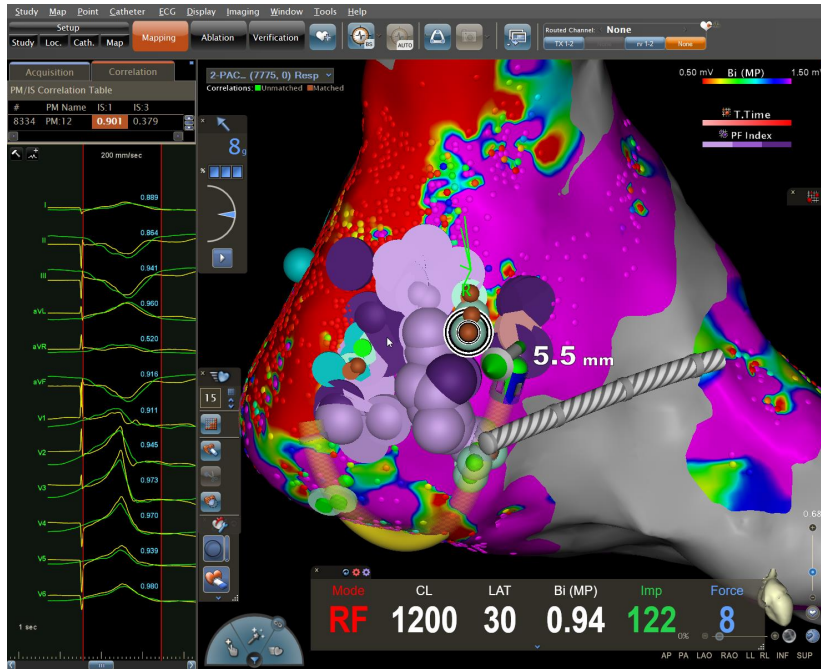




What about the ventricle?



What about the ventricle?

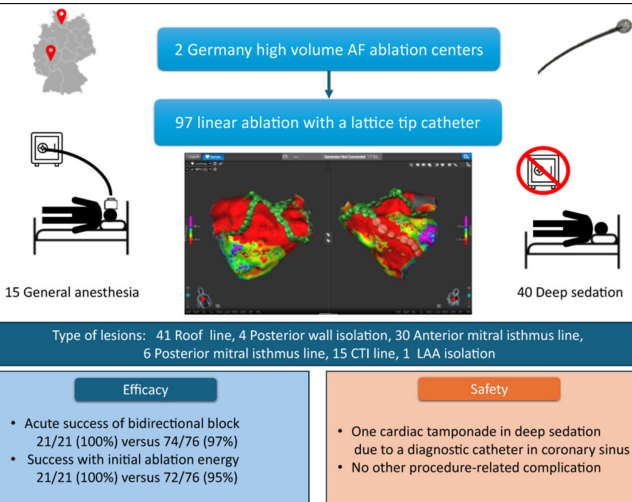




Atrial Fibrillation - Ablation

Feasibility of atrial linear ablation using a lattice tip catheter that toggles between radiofrequency and pulsed-field energy under deep sedation

Jun Hirokami MD¹, Fabian Moser MD², Boris Schmidt MD¹, Stefano Bordignon MD¹, Shota Tohoku MD¹, David Schaack MD¹, Lukas Urbanek MD¹, Andrea Urbani MD¹, Joseph Kheir MD¹, Andreas Rillig MD¹, Bruno Reissmann MD², Feifan Ouyang MD², Laura Rottner MD², Ilaria My MD², Marc Lemoine MD², Andreas Metzner MD², K.J. Julian Chun MD¹



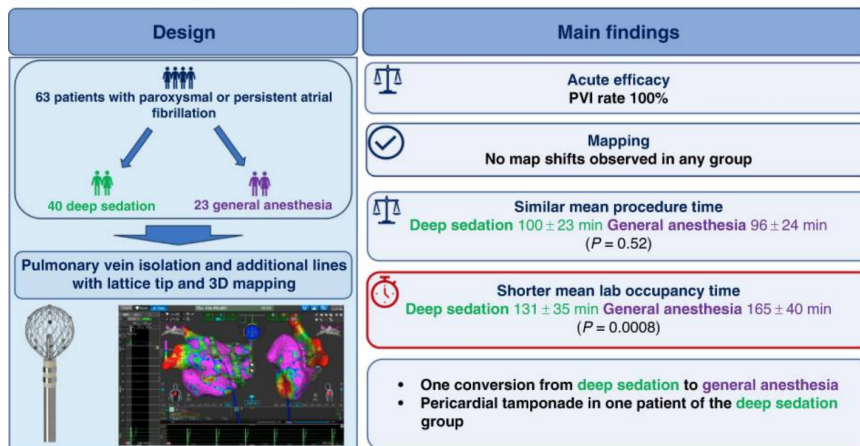
General anaesthesia and deep sedation for monopolar pulsed field ablation using a lattice-tip catheter combined with a novel three-dimensional mapping system

Andreas Rillig¹, Jun Hirokami^{2,3}, Fabian Moser¹, Stefano Bordignon^{2,3}, Laura Rottner¹, Tohoku Shota^{2,3}, Ilaria My¹, Andrea Urbani^{2,3}, Marc Lemoine¹, Joseph Kheir^{2,3}, Niklas Schenker¹, Lukas Urbanek^{2,3}, Katarina Govorov¹, David Schaack^{2,3}, Julius Obergassel¹, Jan Riess¹, Djemal Ismaili¹, Paulus Kirchhof¹, Feifan Ouyang¹, Boris Schmidt^{2,3}, Bruno Reissmann¹, Kyoung-Ryul Julian Chun^{2,3}, and Andreas Metzner¹

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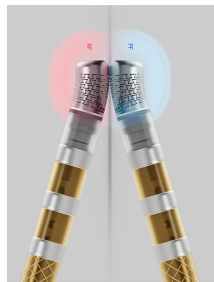


Un catetere dual-energy permette di:

- usare **PFA** dove serve *sicurezza e selettività*
- usare **RF** dove serve *precisione, profondità e modulazione fine della lesione*

**TAILORED
APPROACH**

Index targets for PF and RF ablations are important tools helping to predict the quality of the lesions



***“La versatilità non è avere due energie.
E’ avere una scelta”***





Non è la specie più forte che sopravvive, né la più intelligente, ma quella che meglio si adatta al cambiamento

C. Darwin

