

ADVANCES IN CARDIAC ARRHYTHMIAS *and* GREAT INNOVATIONS IN CARDIOLOGY

XXVI Giornate Cardiologiche Torinesi



UNIVERSITÀ DEGLI STUDI DI TORINO



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Turin

October 23-25, 2014

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Centro Congressi Unione Industriale di Torino

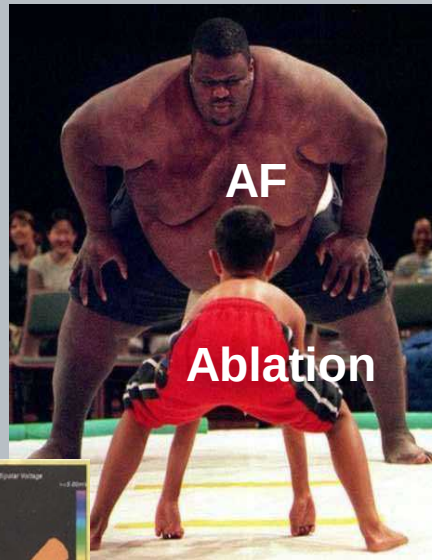
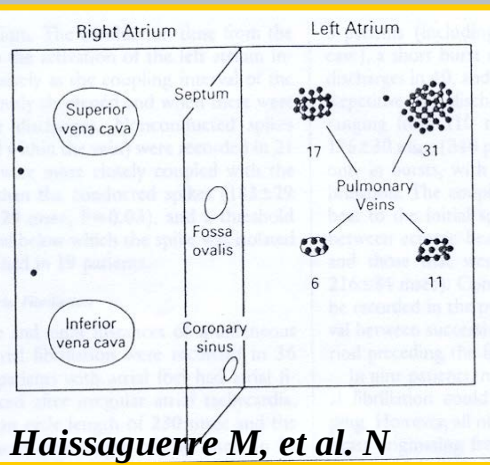
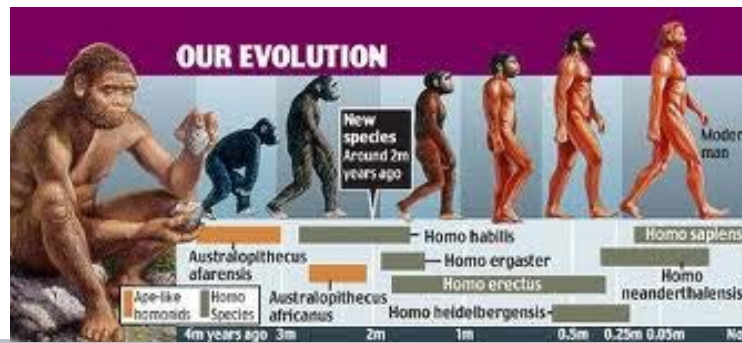
***No fluoroscopy EP Lab, No
Compromises***

Impact of contact force
TactiCath measurement
on outcome, reduction of
rx and procedure time in
AF ablation

Alessio Borrelli, MD

**Division of Electrophysiology
Policlinico Casilino, Rome**

Evolution



A New Approach for Catheter Ablation of Atrial Fibrillation: Mapping of the Electrophysiologic Substrate

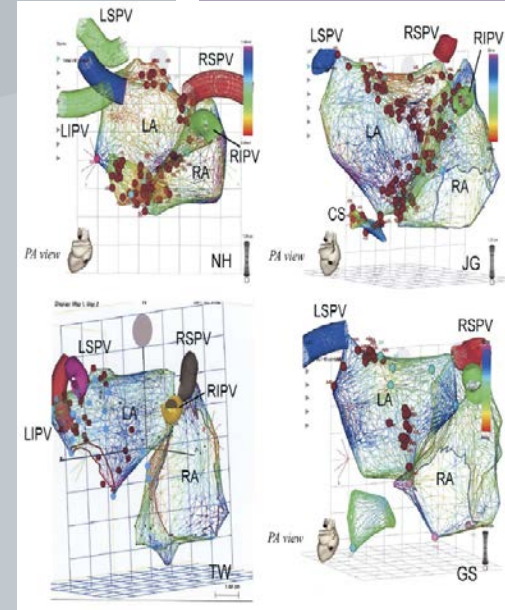
Koonlawee Nademanee, MD, FACC,* John McKenzie, MD,* Erol Kosar, MD,* Mark Schwab, MD,* Buncha Samsaneewitayakul, MD,* Thaveekiat Vasavakul, MD,* Chotikorn Khunnawat, MD,* Tachapong Ngarmukos, MD†
 Inglewood, California; and Bangkok, Thailand

JACC 2004

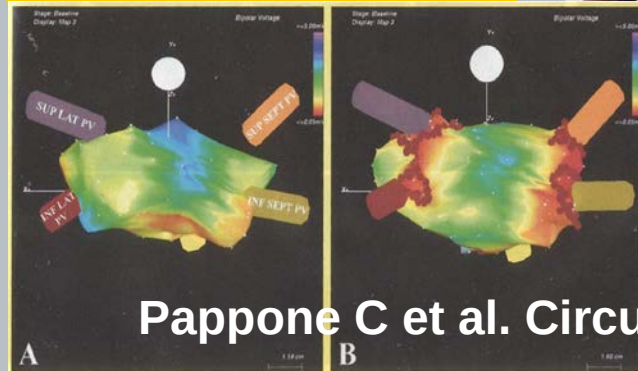
- 121 pts (64 chronic AF)

- Using CARTO, multiple fractionated electrograms identified as ablation targets in both atria (commonly on the interatrial septum).

- After the 2nd procedure the pts AF free were 91%



Pappone C et al. Circulation 2000



Evolution?

Author and year	pts	technique	fup	PAF	PEF
Pappone C. JACC '03	589	Circumferential	30 m	81.5%	75.4%
Stabile G. EHJ '06	68	Circumferential	12 m	56%	56%
Bhargava M. JCE '04	323	Circumferential	15 m	86%	78%
Oral H. Circ '03	40	Circumferential	6 m	88%	
	40	Segmental		67%	
Karch M.R. Circ '05	50	Circumferential	6 m	42%	
	50	Segmental		66%	
Mantovan R. JCE '05	30	Circumferential	15 m	57%	
	30	Comb (segm + circ)		83%	
Tse H.F. JACC '03	52	Segmental	12 m	58%	43%
Bourke J.P. Heart '05	100	Segmental	6 m	73%	45%
Arentz T. Circ '03	55	Segmental	12 m	70%	44%
Nademanee K. JACC '04	121	Fragmented EGM	12 m	95%	87.5%
Jais P. HRS '06	74	Segmental, lines, fragmented EGM	18 m	91%	
Oral H. Circ '06	153	Circumferential, fragmented EGM	11 m	77%	
Oral H. NEJM '06	77	Circumferential			74%
Calò L. JACC '06	41	Lines (left atrium)	14 m		61%

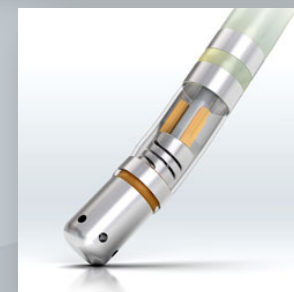
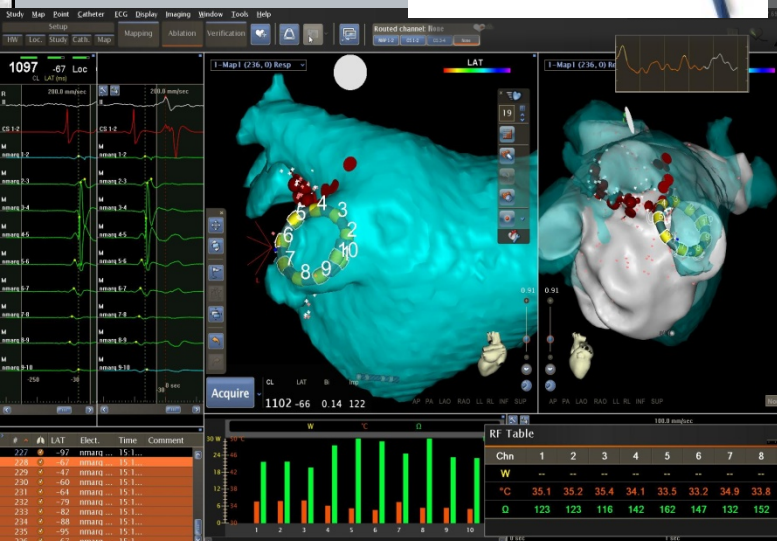
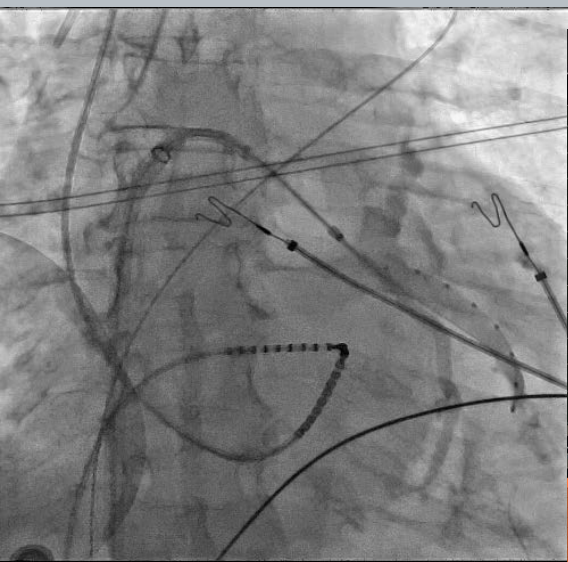
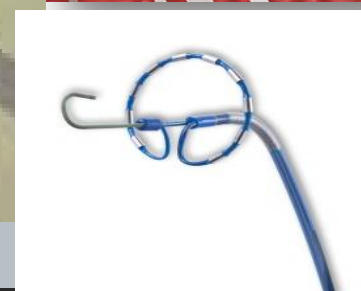
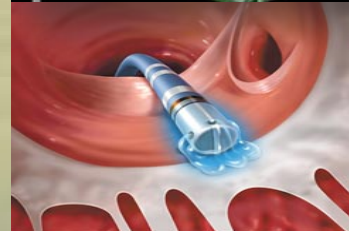
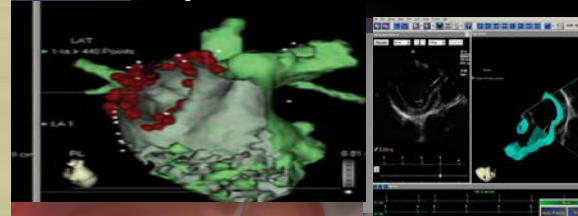
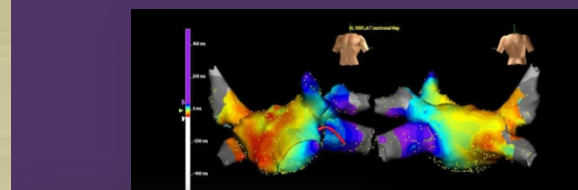
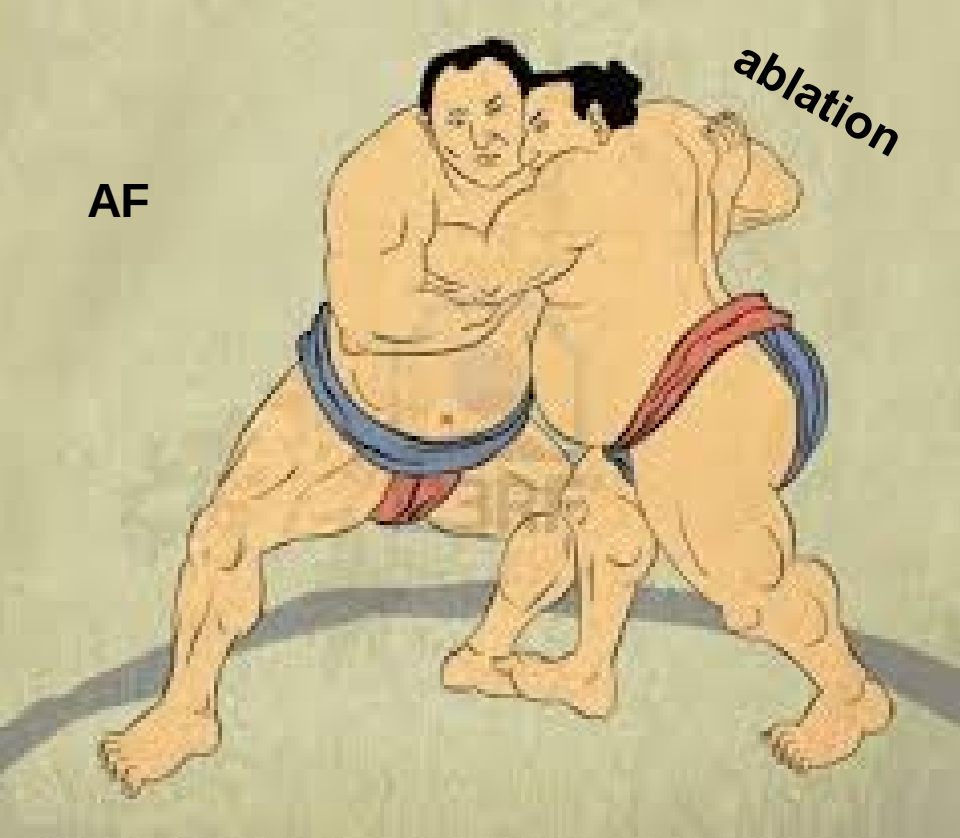
Up-dated Worldwide Survey on the Methods, Efficacy and Safety of Catheter Ablation for Human Atrial Fibrillation

Cappato R et al. Circulation Arrh 2009

Type of AF	No. of Centers	No. of Pts	Success without AADs		Success with AADs		Overall Success	
			No.	Rate	No.	Rate	No.	Rate
			of Pts	*Median	of Pts	*Median	of Pts	*Median
				[Interquartile range]		[Interquartile range]		[Interquartile range]
Paroxysmal	85	9,590	6,580	74.9 [64.9-82.6]	1,290	9.1 [0.2-14.7]	7,870	84.0 [79.7-88.6]
Persistent	73	4,712	2,800	64.8 [52.4-72.0]	595	10.0 [0.8-15.2]	3,395	74.8 [66.1-80.0]
Long-lasting	40	1,853	1,108	63.1 [53.3-71.4]	162	7.9 [0.9-15.9]	1,270	71.0 [67.4-76.3]

AF

ablation

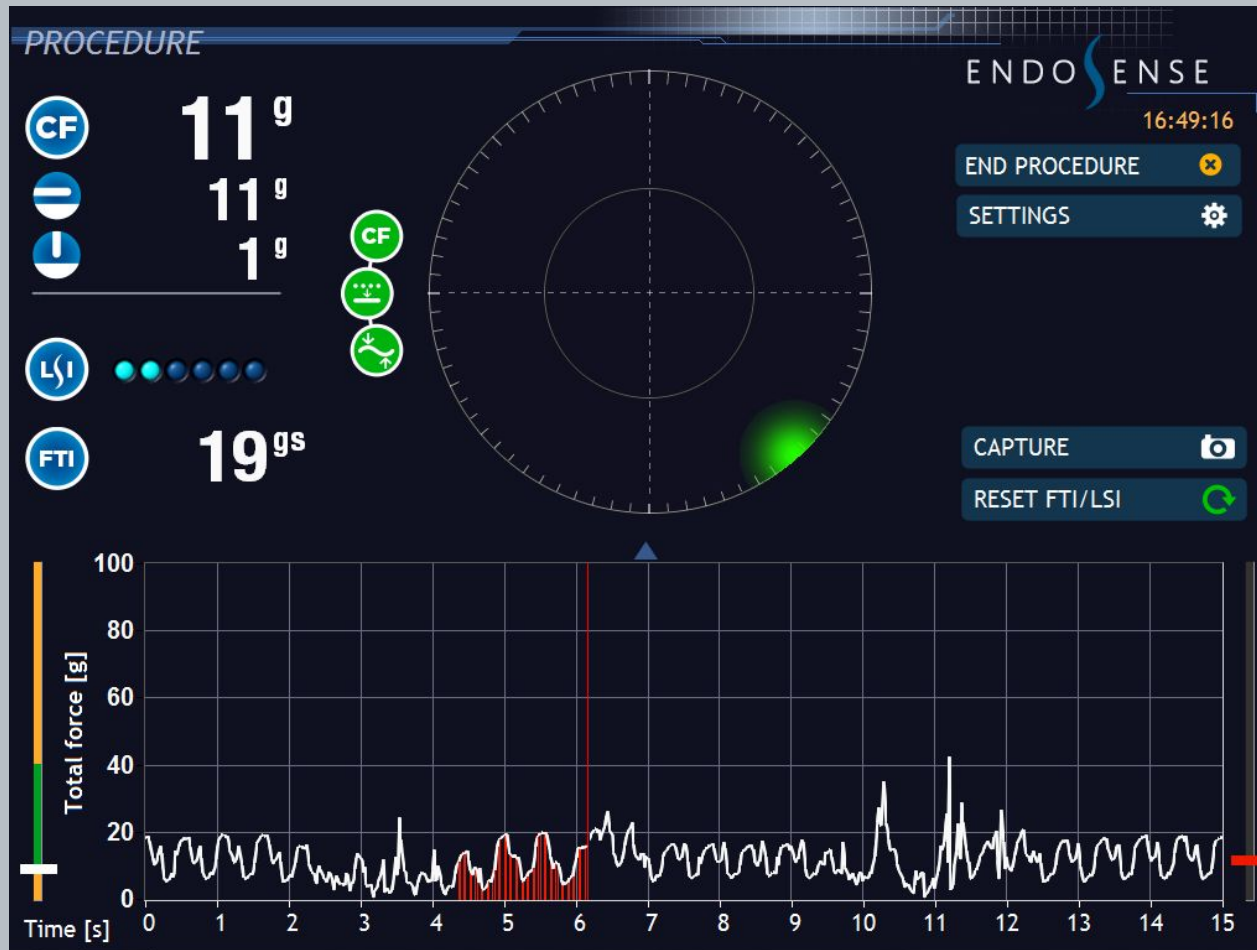


Lab Routine

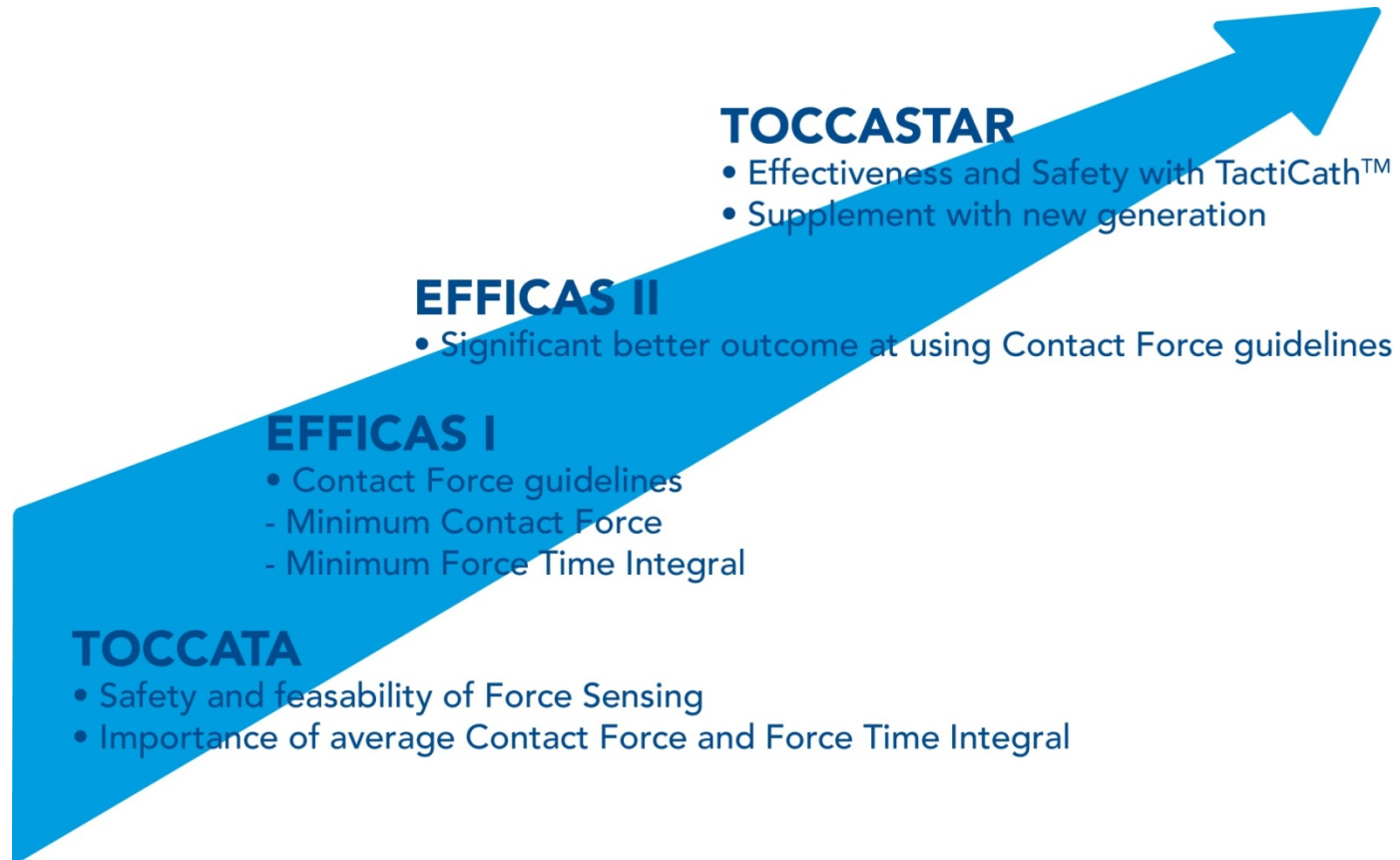
Contact sensor



Contact sensor



Litterature



Supraventricular Arrhythmias

Case 1

55 y/o patient

Symptomatic for palpitation and fatigue

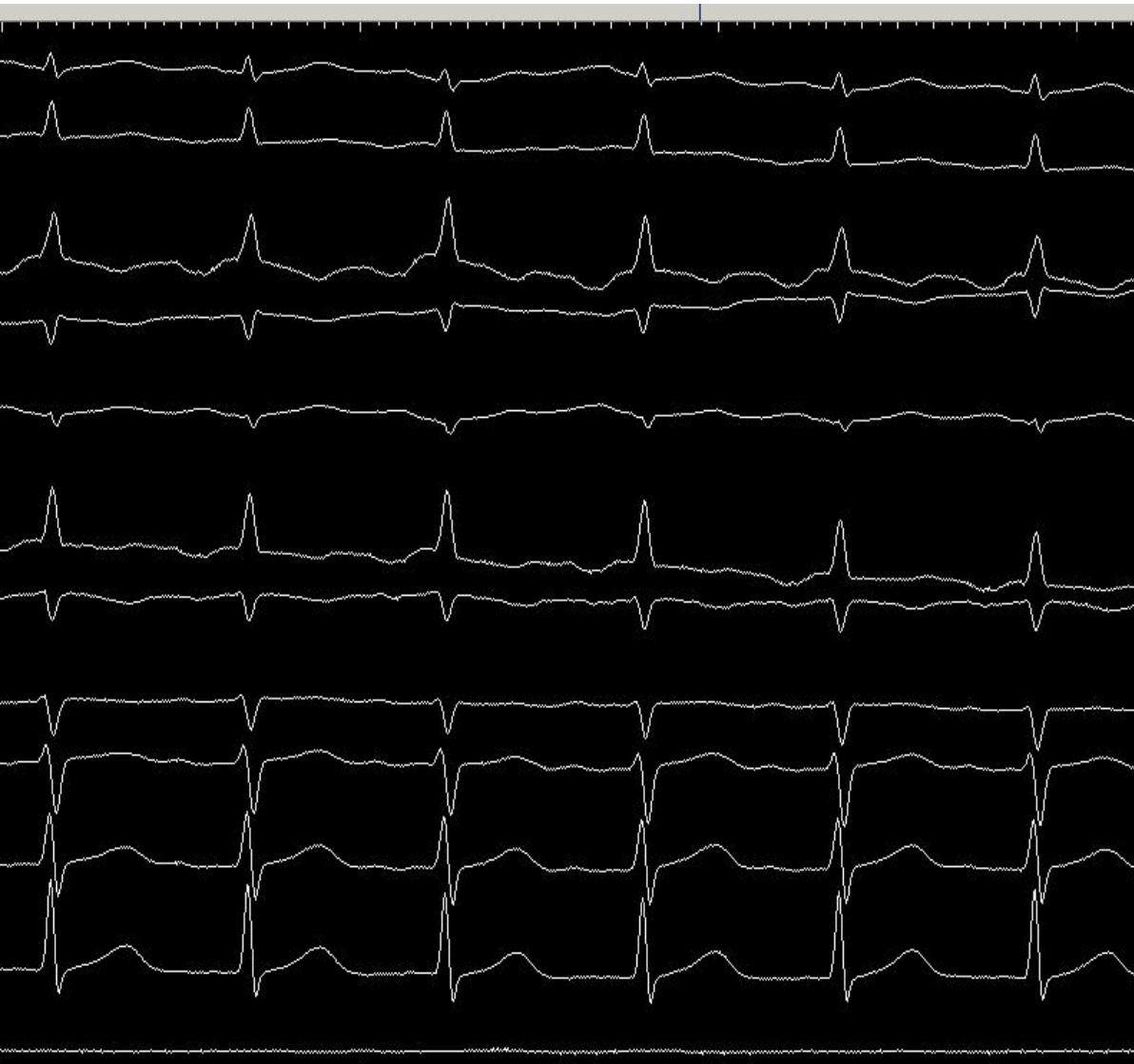
NYHA Class IIb

Admitted for AF e FLA

Failed Amiodarone, Flecainidis worsening, Propafenone
some benefit, better in Verapamil+metoprolol (fatigue)

Scheduled Procedure PVI + CTI

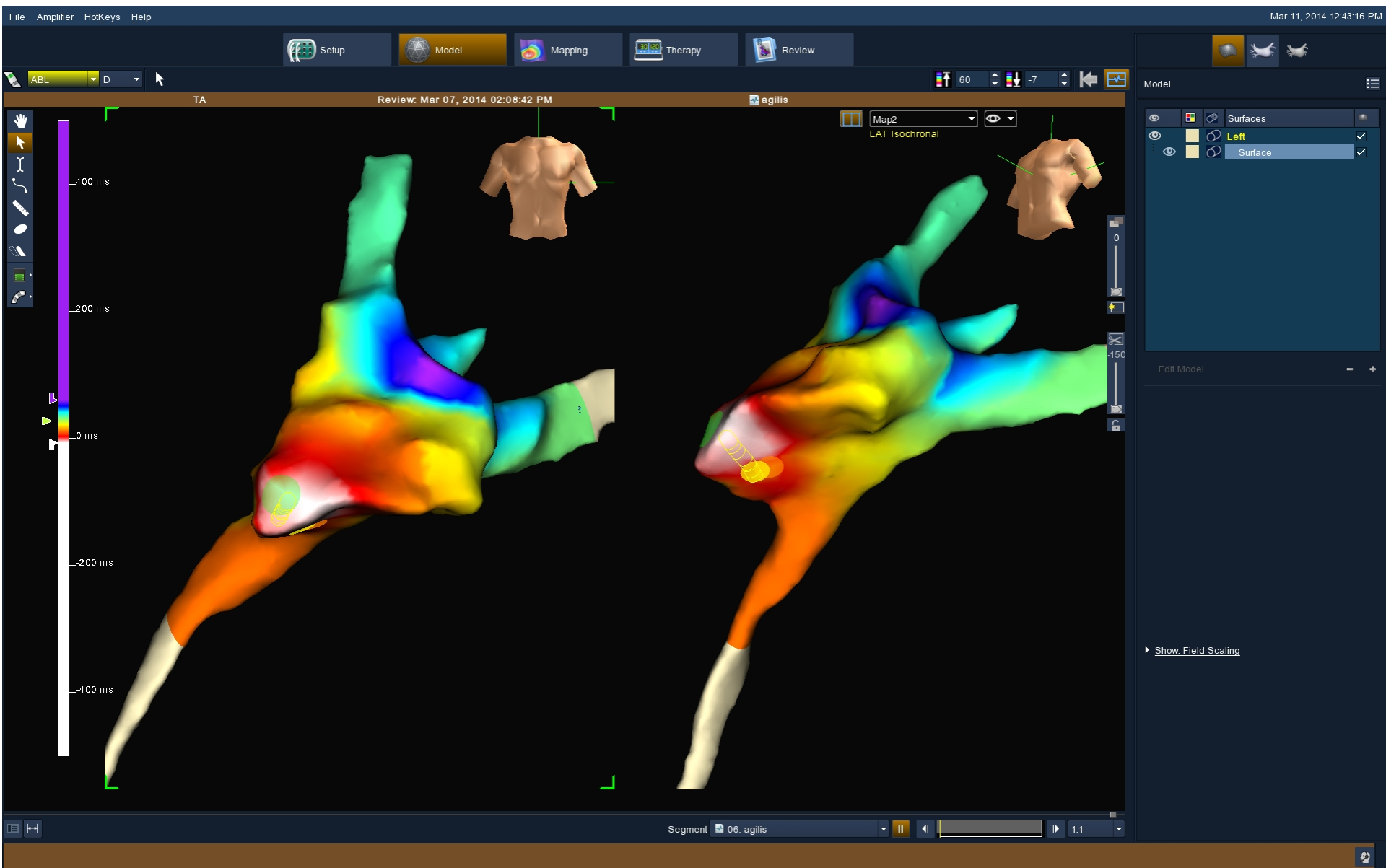
Basal ECG



Intracavitary signals

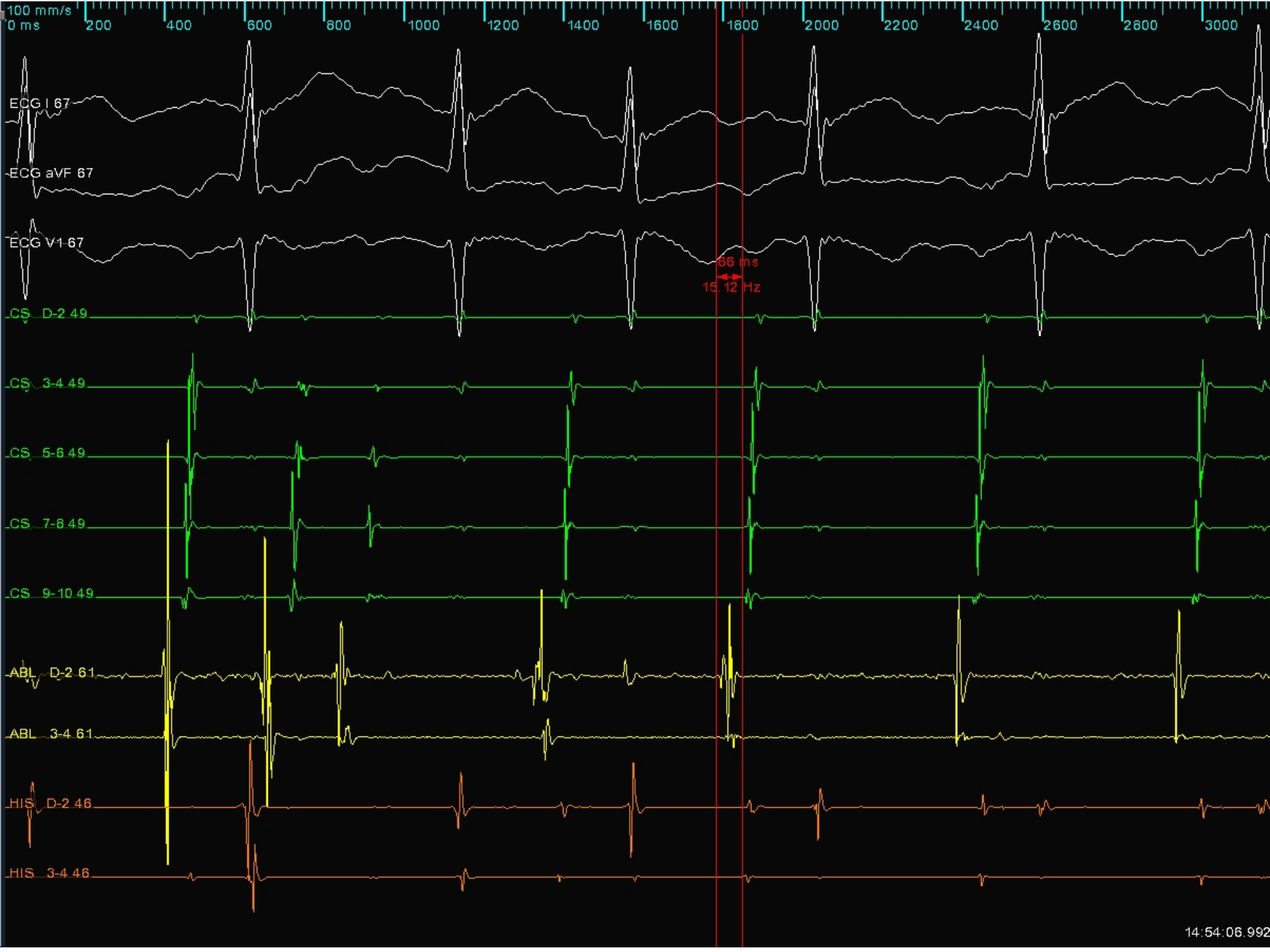


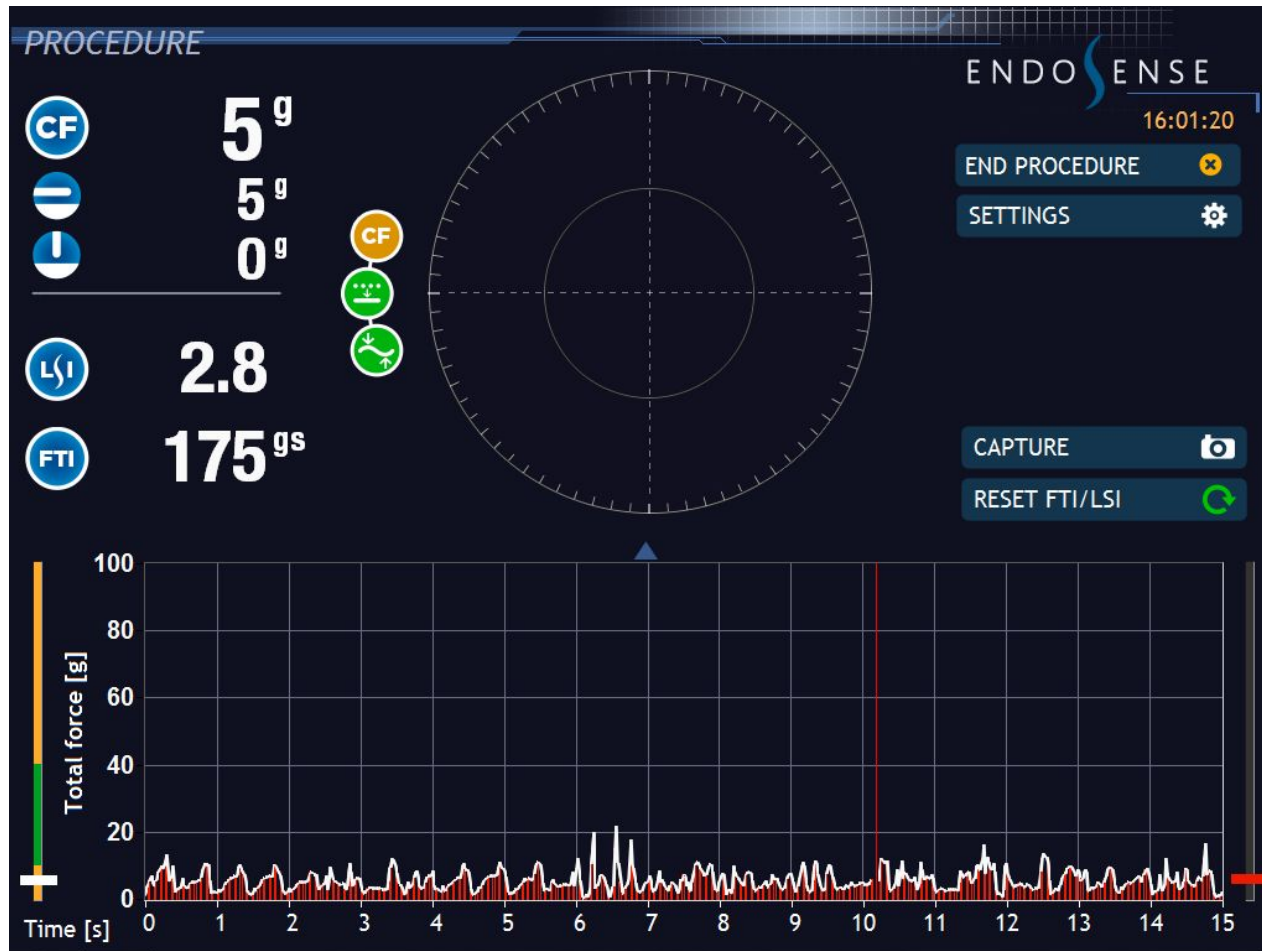
Activation Map



AF during Mapping Ganglia?

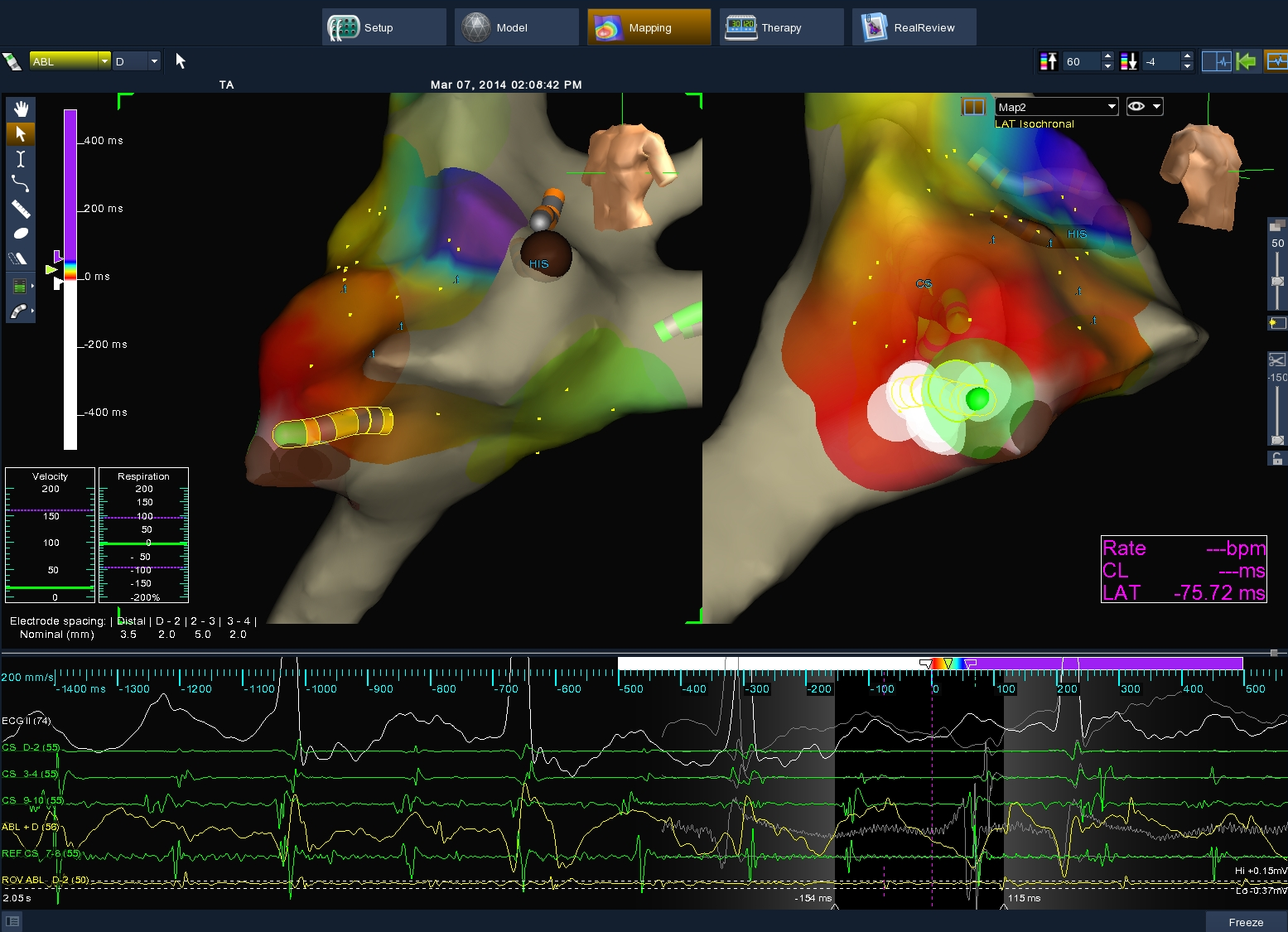






45 sec 35 W

FTI very low



Mapping OneMap

Map2

Project Map to: Closest

Cardiac Triggered Reference ☒ Unipole ☐

Current Map Type

☒ LAT ☐ CFE Mean

☐ Peak-to-Peak ☐ CFE Std. Dev.

☐ Peak-Negative

Settings Points Model

Low-V ID 0.000

Map Display

☒ Standard LAT

☐ Reentrant Map

☐ Propagation Map

Play 10

Map Appearance

Interior Projection 8

Exterior Projection 8

Interpolation 7

Points/Labels

☐ 3D Points

☐ 3D Labels

☐ 3D Annotations

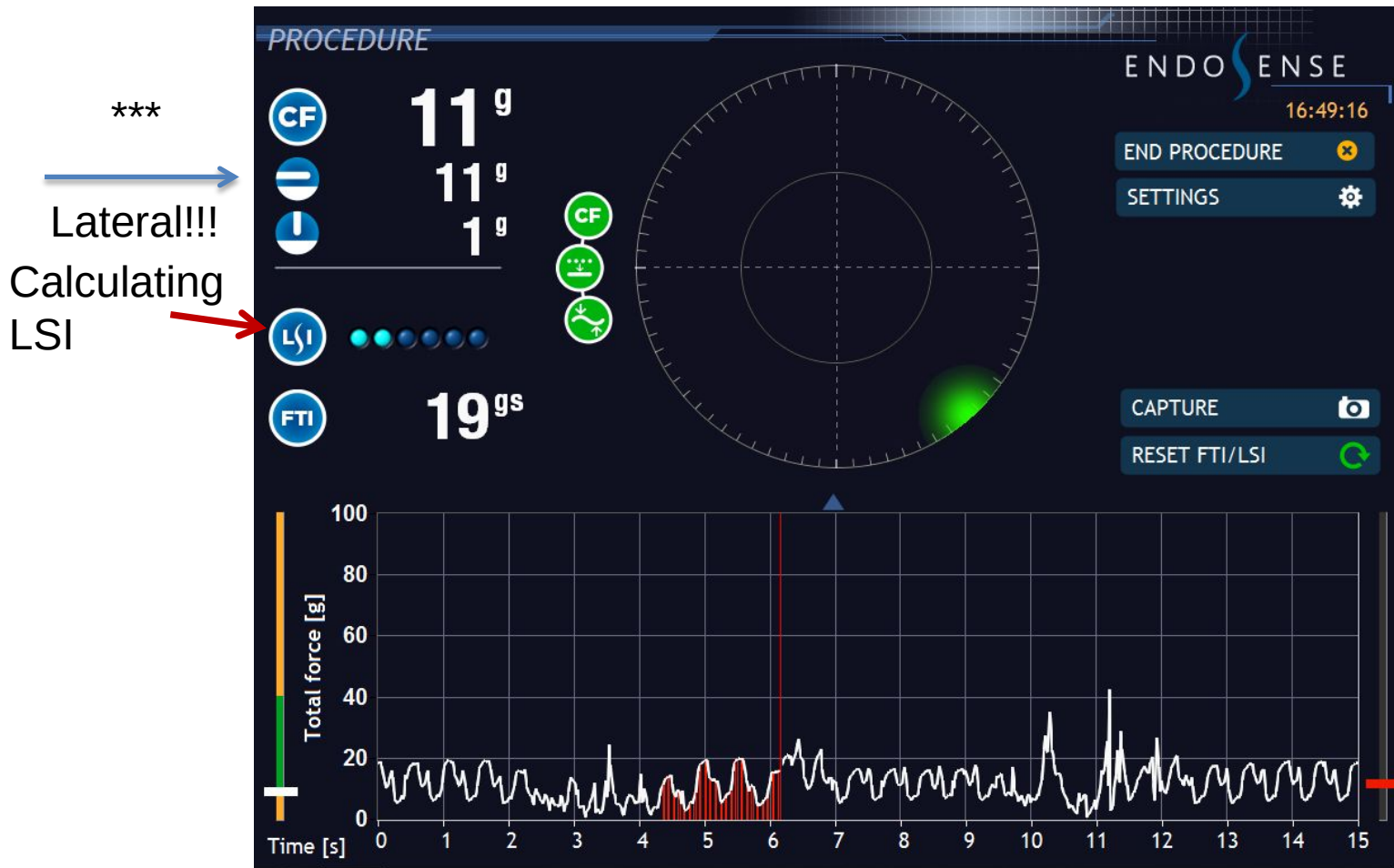
☒ Surface Points

Appearance

☒ Auto Color

☒ Show HR/CL

2° Ablation Lateral Force > 10 gr



Ablazione efficace 10 gr

File Amplifier HotKeys Help

Mar 07, 2014 03:52 PM



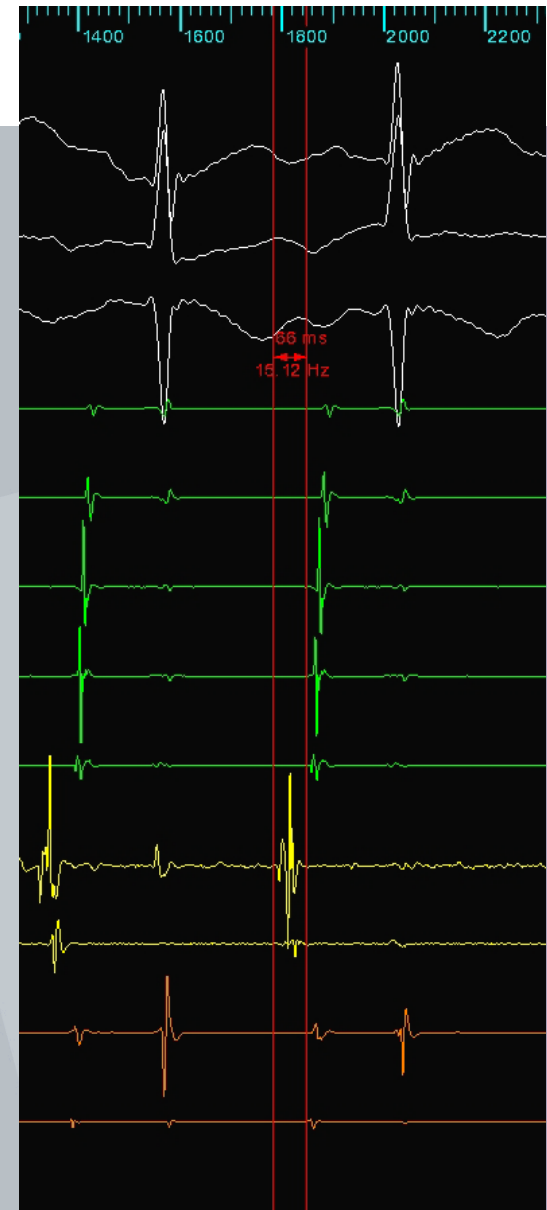




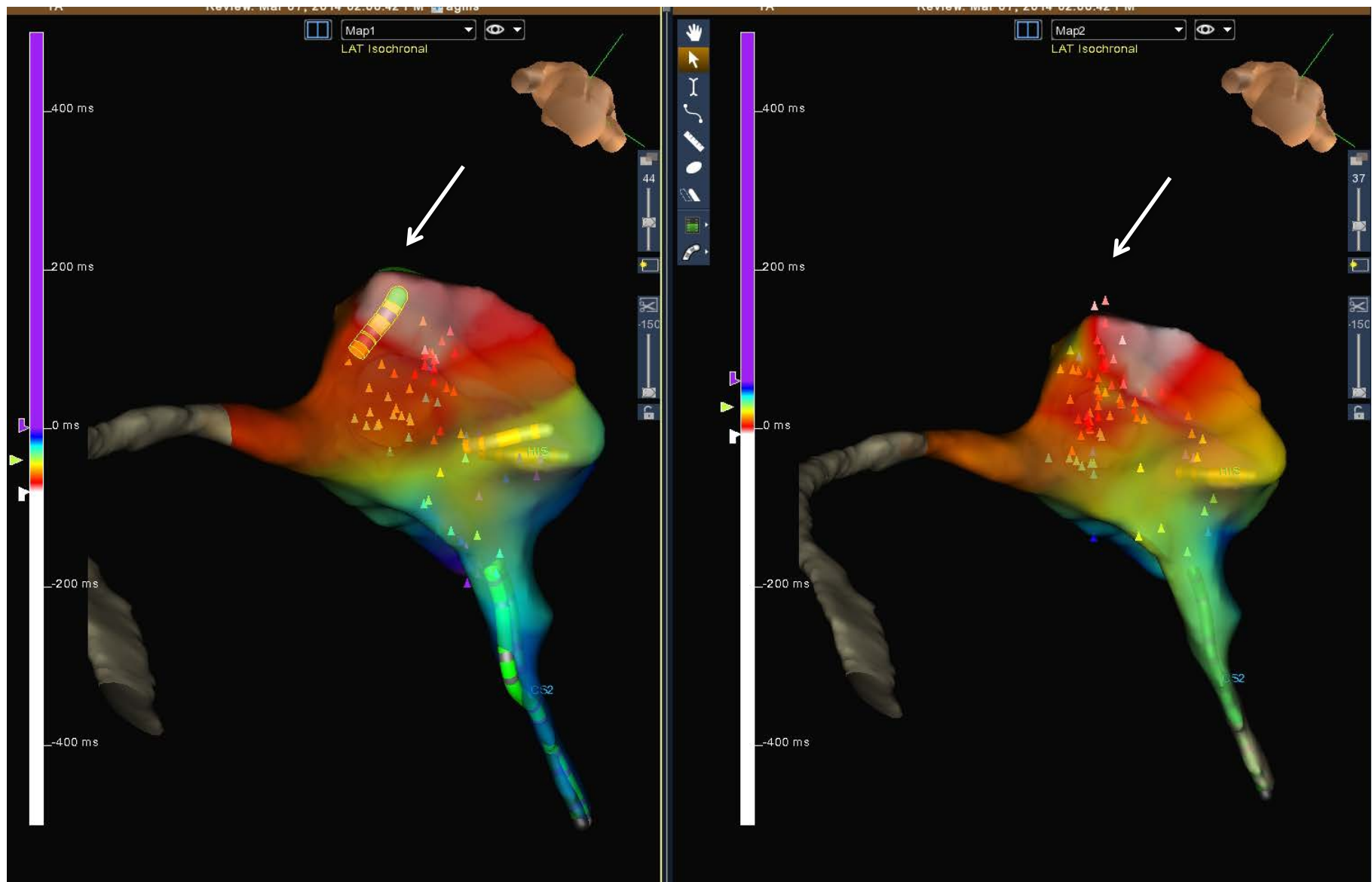
15 min
later

What to do?

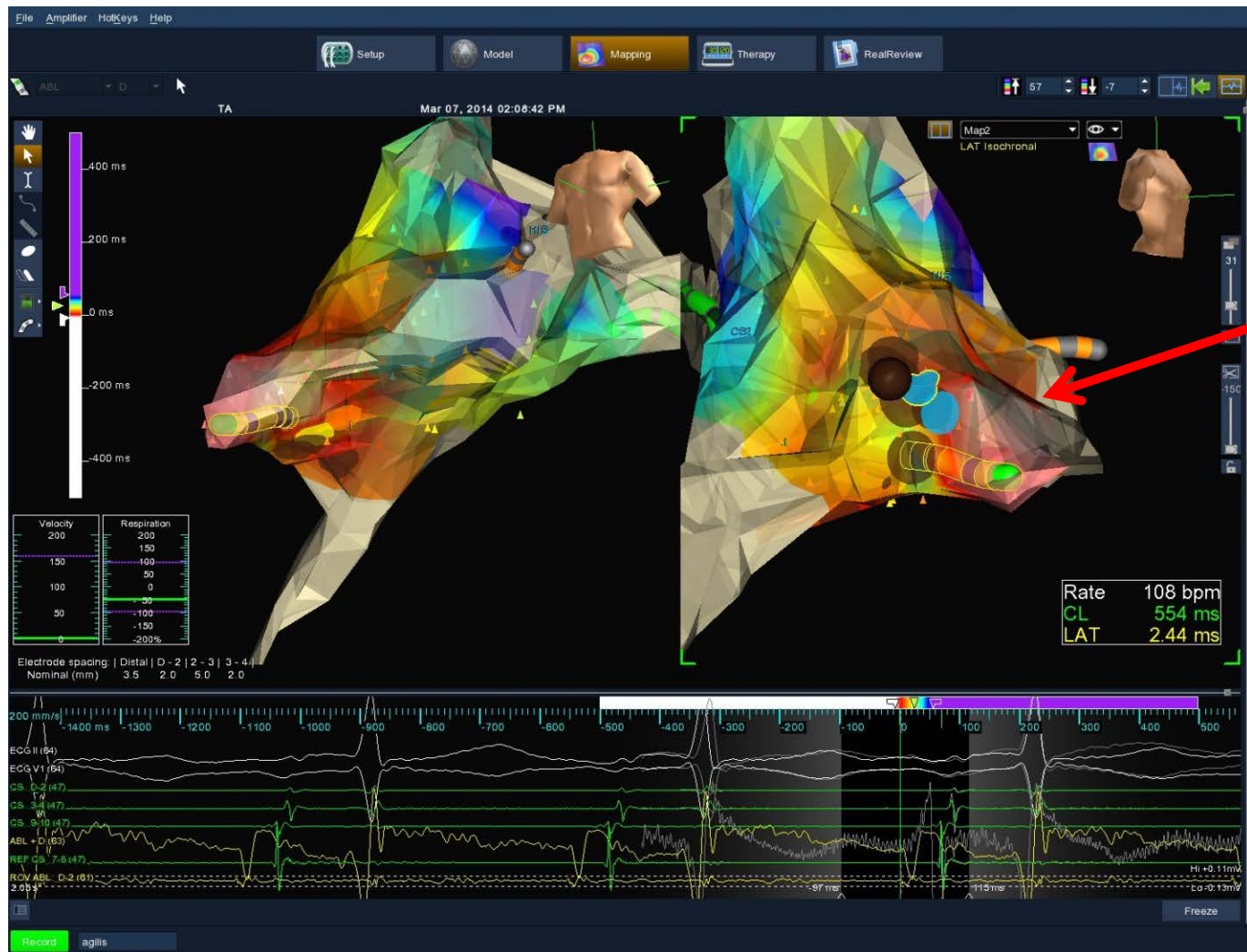
1. Change Catheter
2. Increase Power
3. Use a steerable Sheath
4. Change operator



AGILIS



Finally

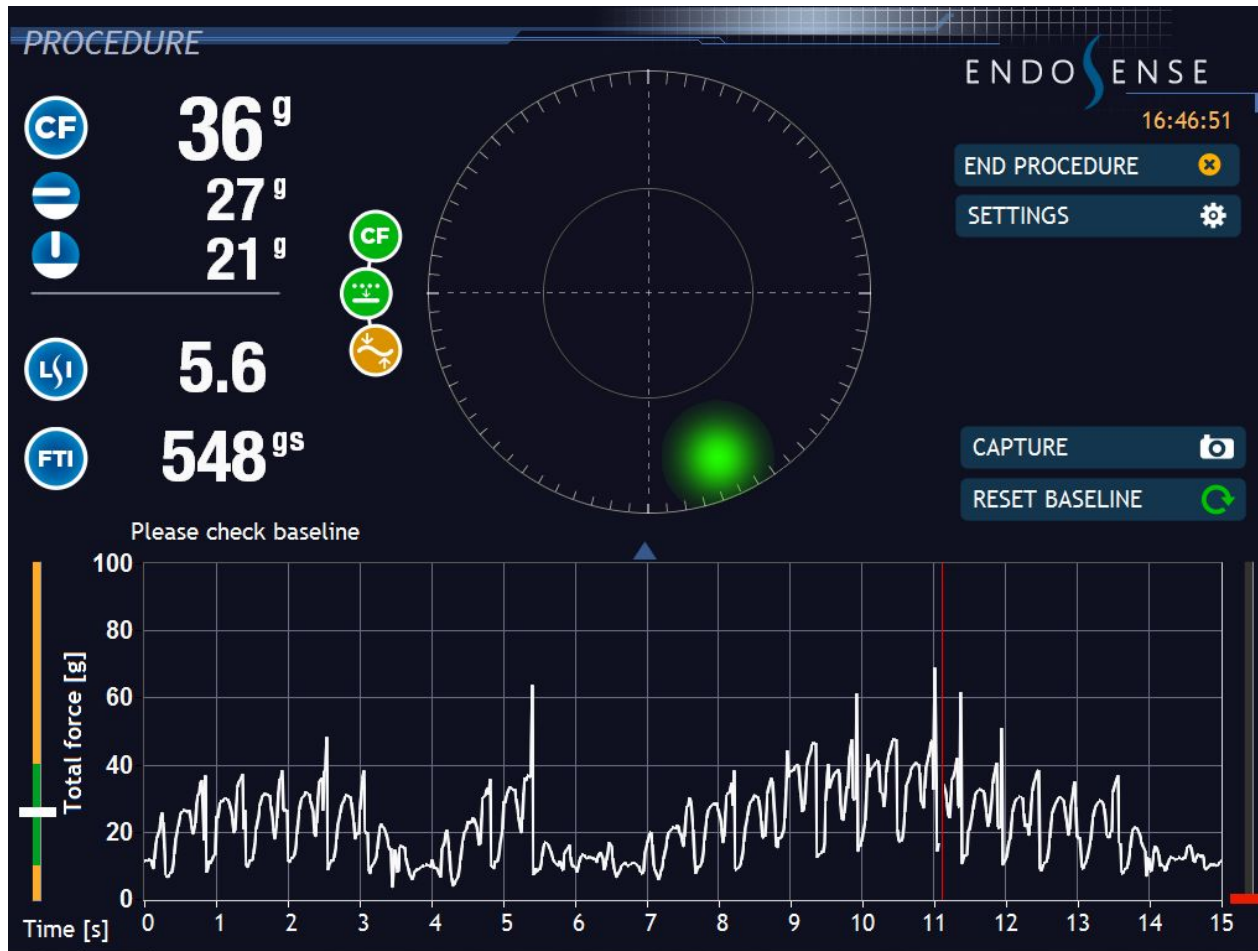


More
Ventricular
Signal



More Balanced Signal

A little better



Single erogation
Drop down to 30 W
45 sec

Sinus Rhythm (1)

Sinus Rhythm at the end of the procedure.



Pacing Post Ablation (1)



Pacing Post Ablation (2) + Isoproterenol



Report final

Event	
Screen	11

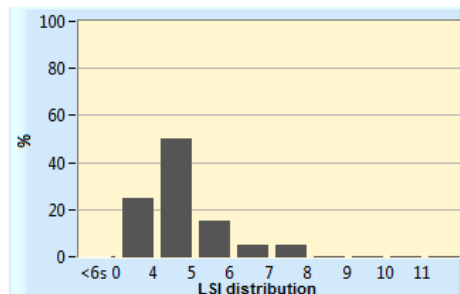
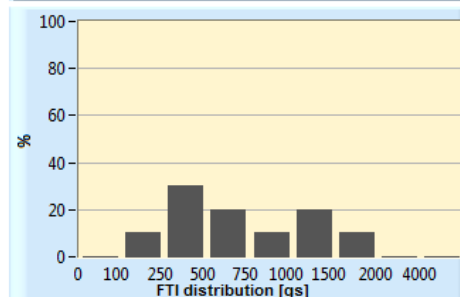
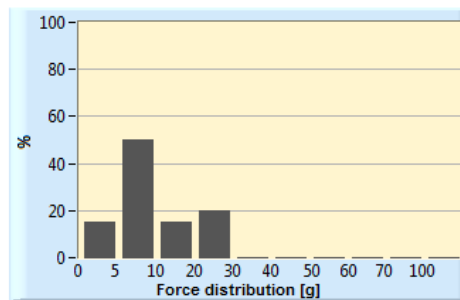
Ablation details - Procedure

Forces	[g]
Min force	3
Avg force	11
Max force	30
StdDev force	8
5 th percentile force	4
95 th percentile force	29

FTI™	[gs]
Min FTI	133
Avg FTI	734
Max FTI	1928
StdDev FTI	497
5 th percentile FTI	136
95 th percentile FTI	1811

LSI	
Shorter than 6 sec	0
Min LSI	2.3
Avg LSI	4.7
Max LSI	7.2
StdDev LSI	1.1
5 th percentile LSI	2.9
95 th percentile LSI	6.9

System information	
WorkStation	QuartzClientPC0
TactiSys Quartz S/N	009811



115131-503423

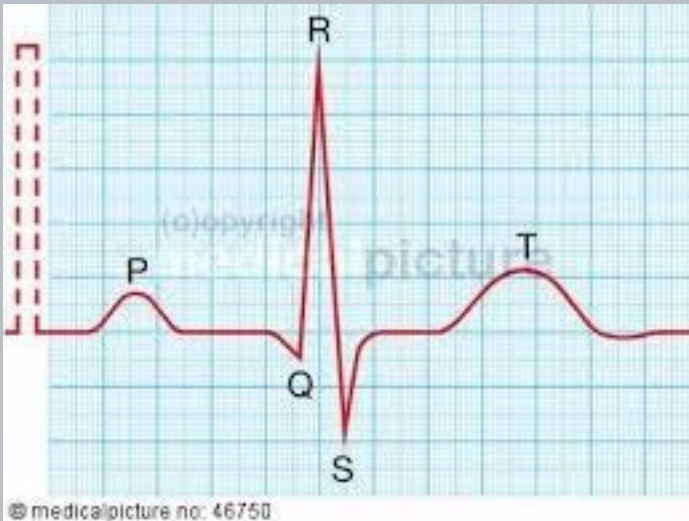
Impact of contact force TactiCath measurement on outcome, reduction of rx and procedure time in AF ablation

Time spared almost 45 min (mapping, ablating and waiting)

Clues > Lateral contact

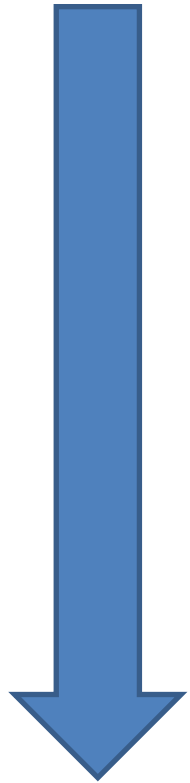
Unless erogation < 10 grs

Impact of contact force TactiCath measurement on outcome, reduction of rx and procedure time in AF ablation



Outcome recurrences?

How To optimize Pulmonary veins deconnection

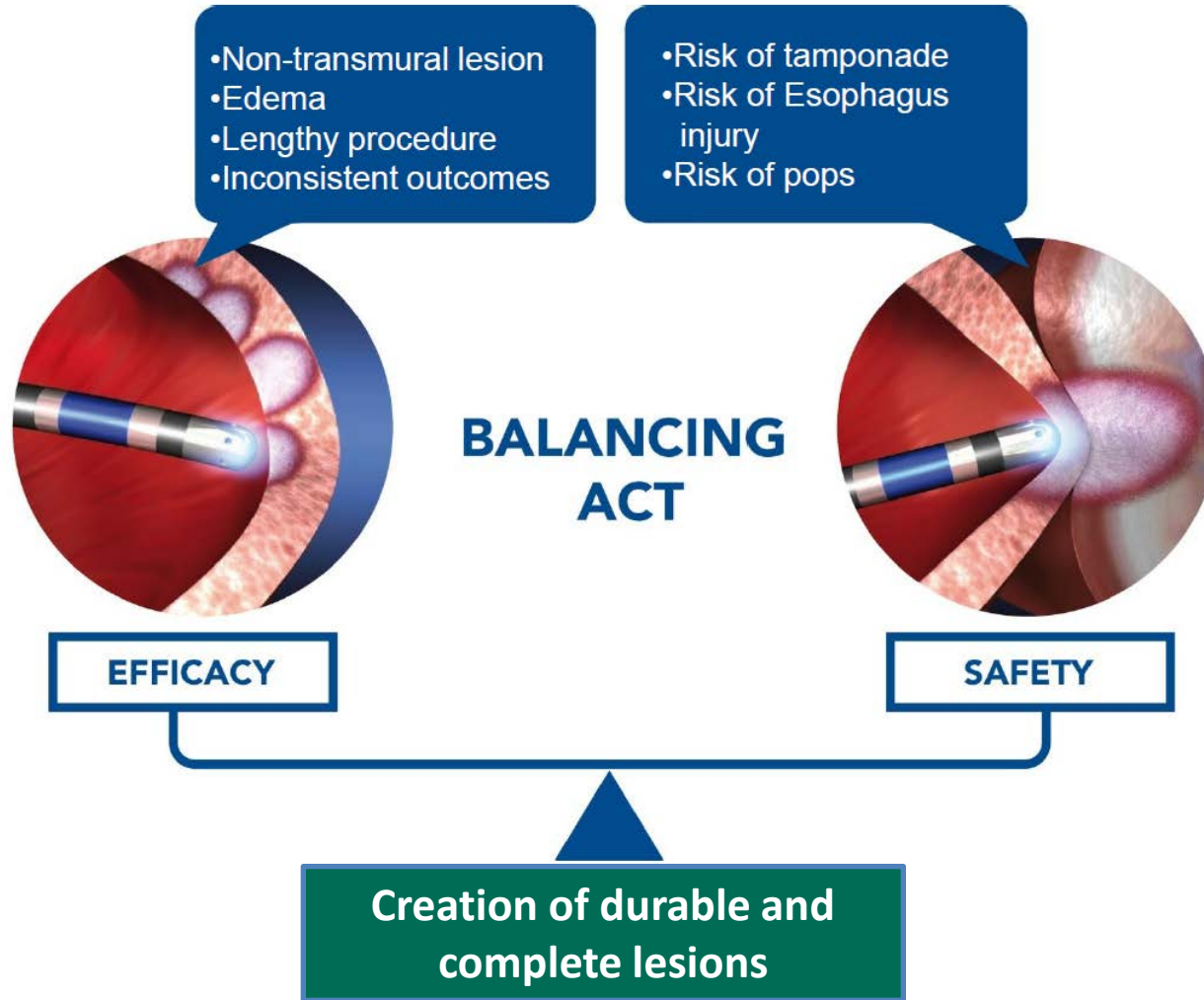


2013

- Adenosin and isoproterenol
- Exit Block
- Entrance block
- Voltage Map
- Reinduction
- Pace and ablate
- Contact force sensors

TactiCath

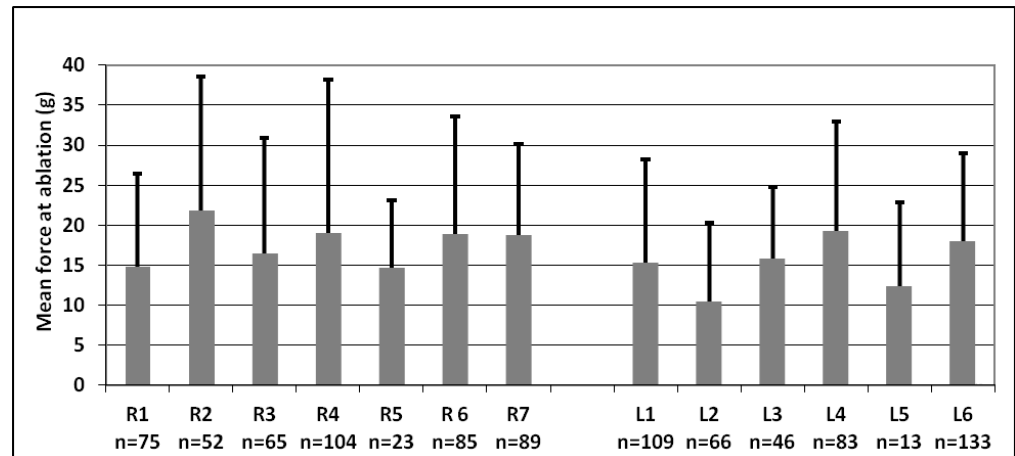
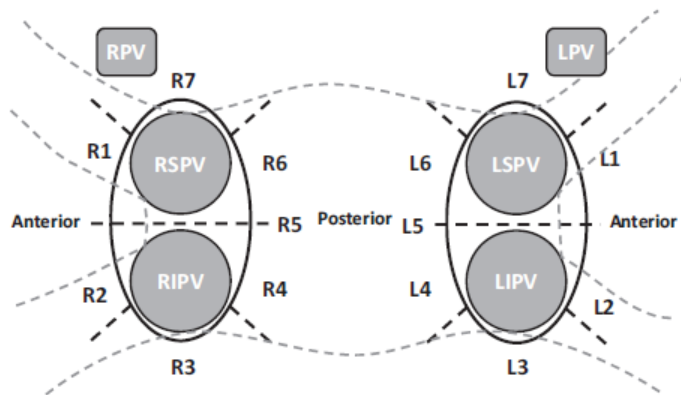
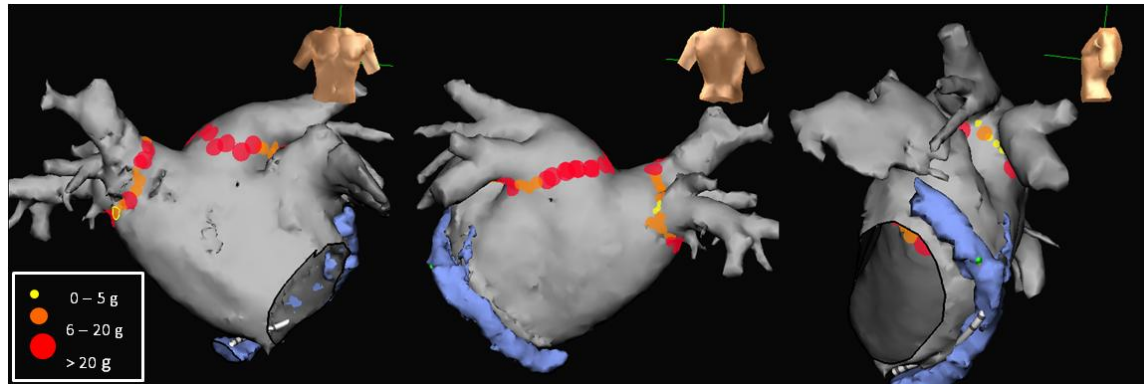
Why Measure Contact Force?



TOCCATA – Results



High variability of Contact Force depending on anatomy



Reddy et al.; The relationship between contact force and clinical outcome during radiofrequency catheter ablation of atrial fibrillation in the TOCCATA study. Heart Rhythm, 2012 Nov;9(11):1789-95.

QUANTITATIVE MAGNETIC RESONANCE IMAGING ANALYSIS OF THE RELATIONSHIP BETWEEN CONTACT FORCE AND LEFT ATRIAL SCAR FORMATION AFTER CATHETER ABLATION OF ATRIAL FIBRILLATION

HEART RHYTHM SOCIETY, MAY 2013, DENVER, CO.

AUTHORS :

Christian Sohns¹, Rasehd Karim¹, James Harrison¹, Aruna Arujuna¹, Nick Linton¹, Ebrahim Palkhi¹, Hendrik Lambert², Giovanni Leo², Steven Williams¹, Reza Razavi¹, Matt Wright¹, Tobias Schaeffer¹, Mark O'Neill¹ and Kawal Rhode.

¹Division of Imaging Sciences and Biomedical Engineering, King's College London, London, United Kingdom, United Kingdom, ²Endosense SA, Geneva, Switzerland, Switzerland.

INTRODUCTION

Catheter contact force (CF) is an important determinant of radiofrequency (RF) lesion quality during pulmonary vein isolation (PVI) for paroxysmal AF (PAF). Late gadolinium enhancement MRI (LGE-MRI) allows visualization of acute and chronic ablation lesions. This study describes a new technique to examine the relationship between contact force achieved during RF delivery and LGE signal intensity following PVI.

METHODS

Six patients underwent PVI for PAF using a CF-sensing catheter TactiCath®, Endosense and following pre-procedural MRI. During ablation, contact force-time integral (FTI) and position was documented for each 40s RF application (25W, 42°C). All patients underwent repeat LGE MRI three months later. The LGE signal intensities were projected onto a 3D shell and the CF maps were generated on the same shells. Using custom-made software, the entire LA surface was divided into 3mm² segments. The force and DE maps were superimposed and compared for each 3mm² zone (Fig. 1). An effective lesion was defined when scar occupied >90% of a 3mm² analysis zone.

RESULTS

268 RF lesions were tagged on the MR shells and given a lesion-specific FTI. Increasing FTI correlated with increased LGE signal intensity (Fig 1) which was greater when the FTI was > 1200gs.

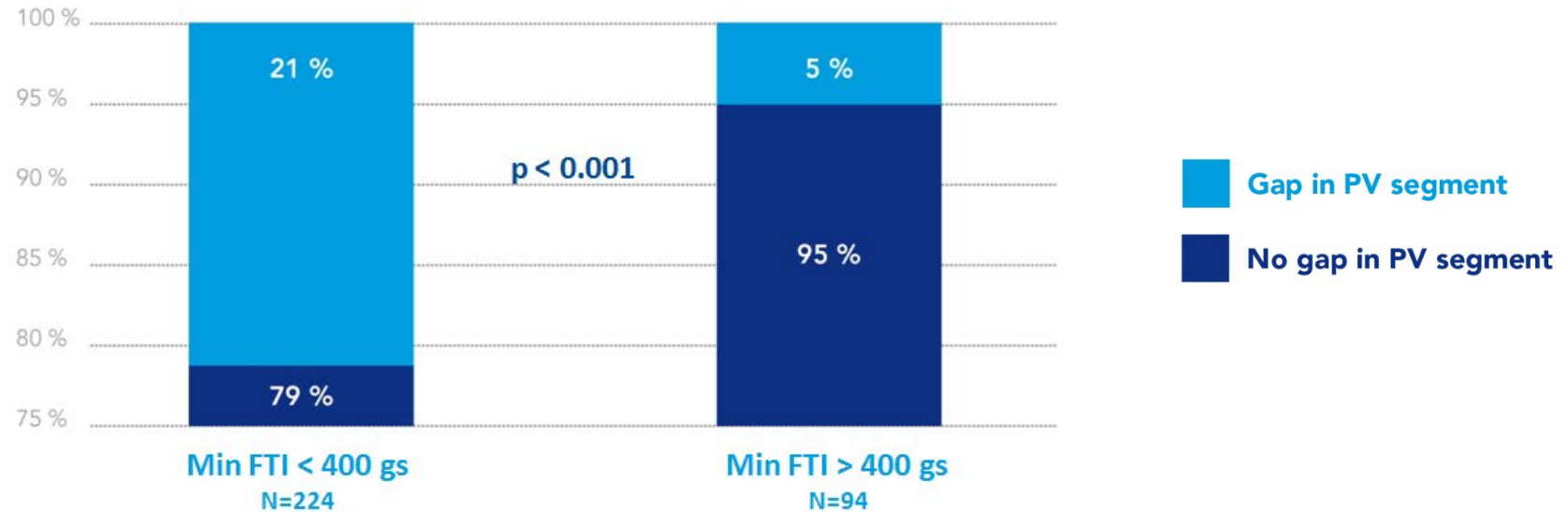
CONCLUSIONS

There is a correlation between FTI and LGE MRI following AF ablation. Real-time FTI maps are feasible and may prevent inadequate lesion formation.



CF blinded

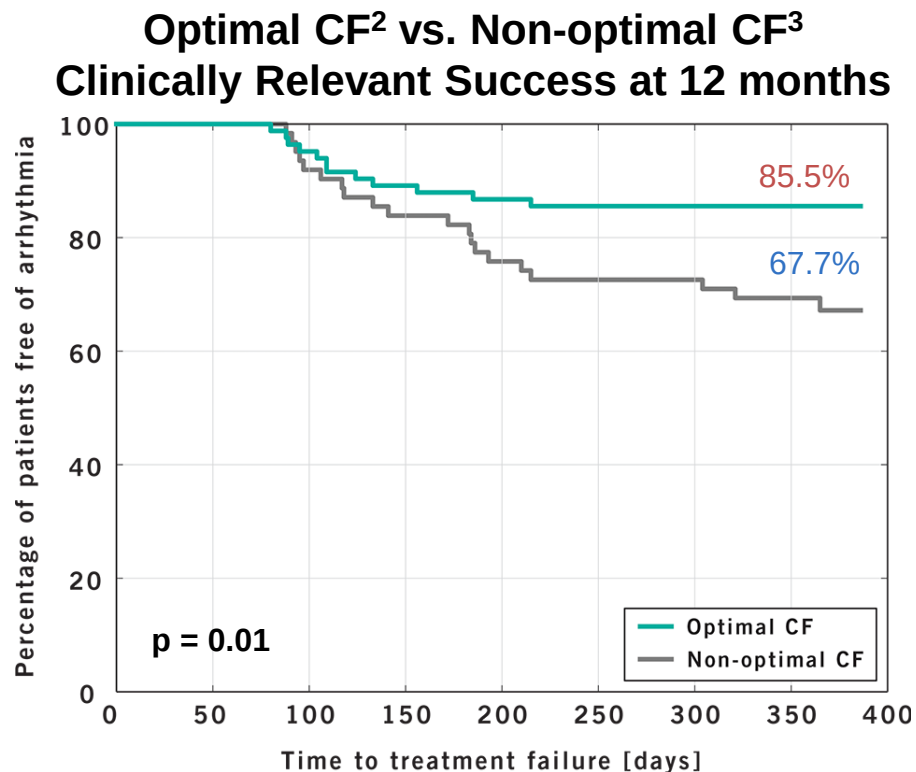
EFFICAS I – Results



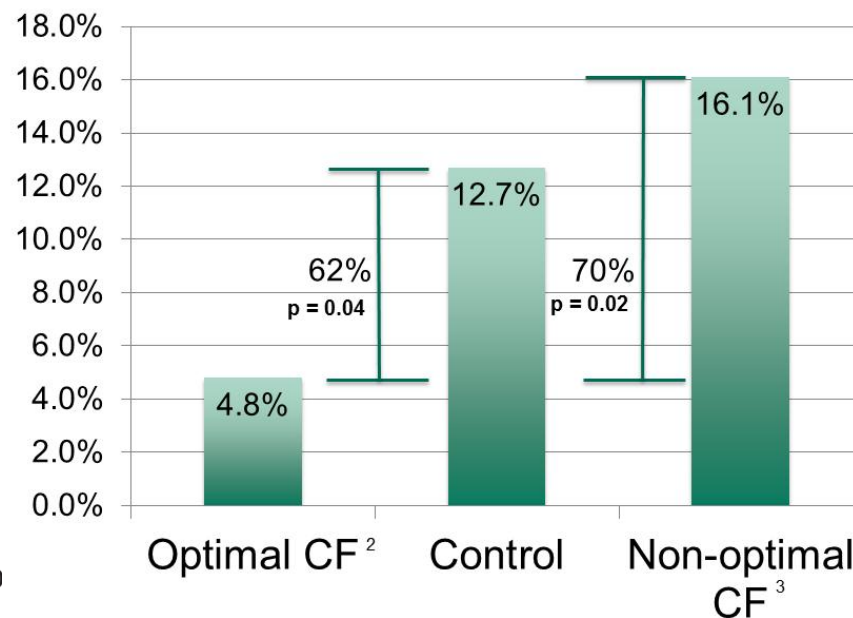
- Each ablation should be made with FTI > 400 gs !

Neuzil et al. Electrical reconnection after pulmonary vein isolation is contingent on contact force during initial treatment: results from the EFFICAS I study. *Circ Arrhythm Electrophysiol.* 2013 Apr;6(2):327-33.

Protocol-Specified Descriptive Endpoint Analysis: Optimal CF Impact on Success and Repeat Ablations



Contact Force and Control: Rate of Repeat Ablation¹

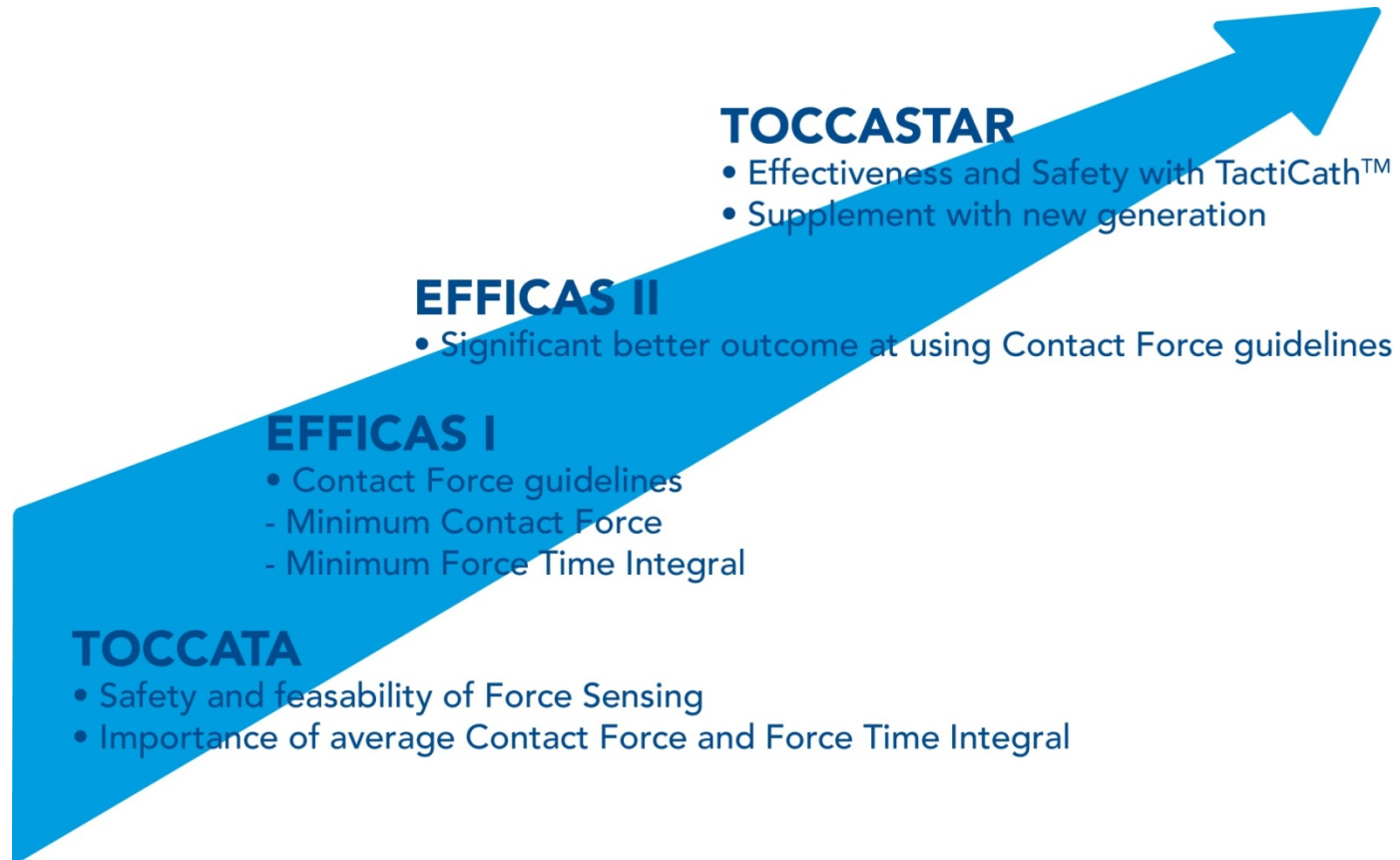


1. Repeat ablation after the protocol defined 3 month blanking period; protocol defined success used for analysis
2. Optimal CF cohort defined as those patients where $\geq 90\%$ lesions $\geq 10g$
3. Non-optimal CF cohort defined as those patients where $< 90\%$ lesions $\geq 10g$

The TactiCath™ Quartz Set is currently undergoing FDA review for premarket approval

CAUTION: Investigational device in the United States. Limited by Federal (or U.S.) law to investigational use. Not available for sale in the U.S.

Litterature



Impact of contact force TactiCath measurement on outcome, reduction of rx and procedure time in AF ablation



German Ablation registry (7300 pcd)

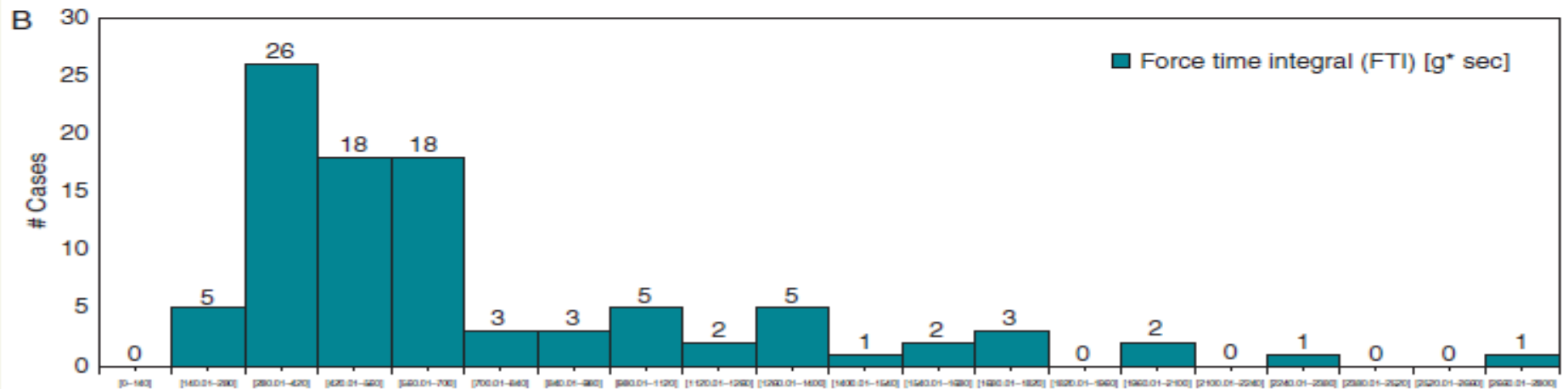
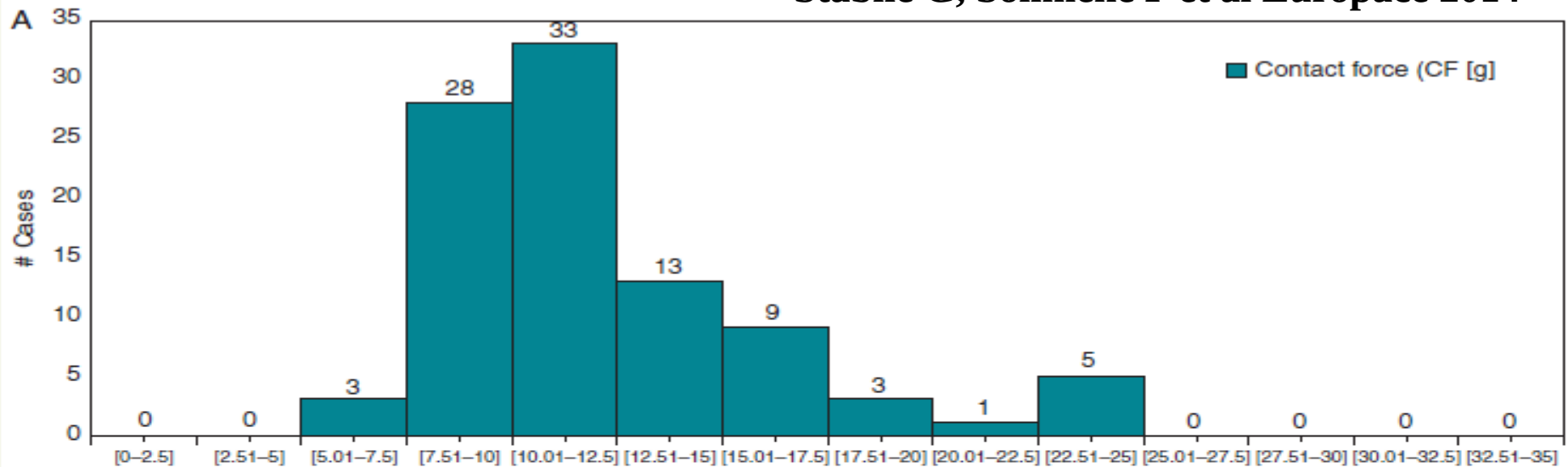
Avg Rx time 27 min

DAP: 34 Gy $\times$ cm²

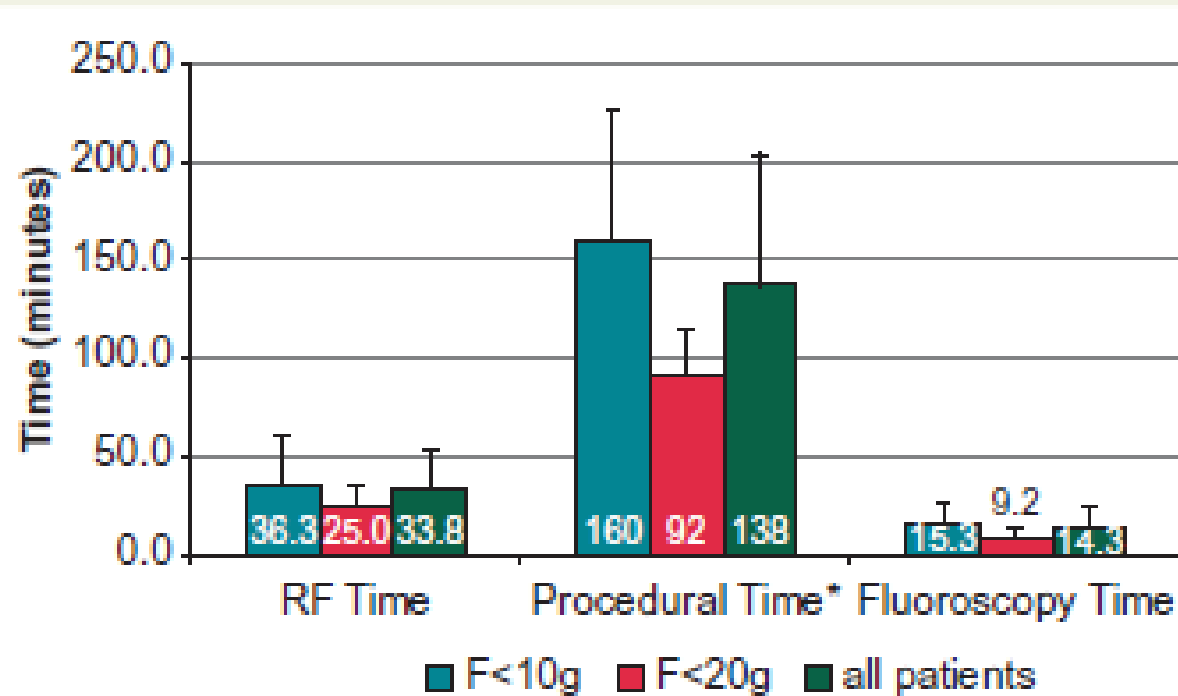
7 mSv

Catheter–tissue contact force for pulmonary veins isolation: a pilot multicentre study on effect on procedure and fluoroscopy time

Stabile G, Solimene F et al Europace 2014



Catheter–tissue contact force for pulmonary veins isolation: a pilot multicentre study on effect on procedure and fluoroscopy time



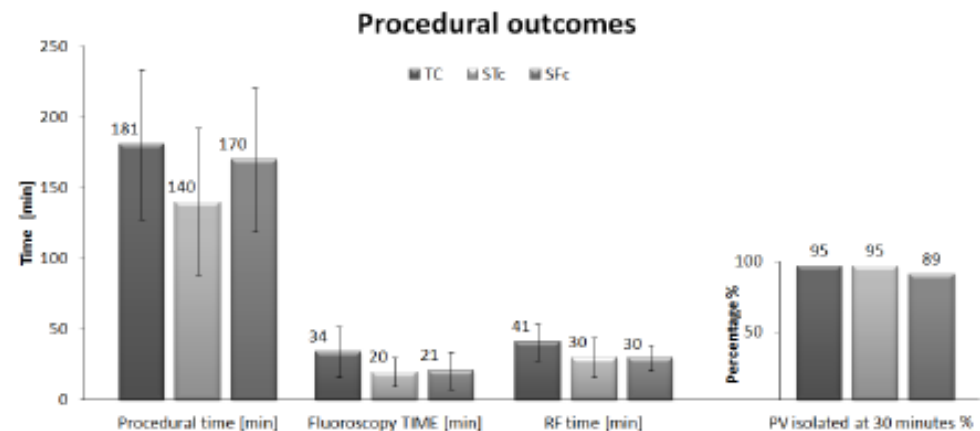
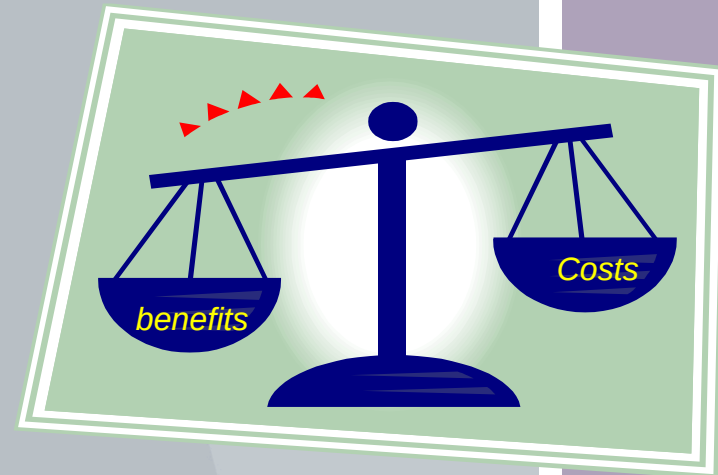
- **Mean CF** value 12.2 ± 3.9 g

- **Force Time Integral (FTI)** < 543 gs longer:
 - procedural time 158 ± 74 vs 117 ± 52 min
 - Fluoroscopy time 17.5 ± 13 vs 11 ± 7.7 min

Contact force during RFCA for PV isolation affects procedural parameters, in particular procedural and fluoroscopy times, without increasing complications.

Own Data submitted

	TCc (a)	STc (b)	SFc (c)	ANOVA P-value
Identified PVs per patient (n)	4.00±0.00	4.05±0.22	3.95±0.22	a vs b: NS a vs c: NS b vs c: NS
Isolated PVs (n)	81	83	80	a vs b: NS a vs c: NS b vs c: NS
% isolated PVs (%)	96%	98%	96%	a vs b: NS a vs c: NS b vs c: NS
RF time (min)	41.3±13.2	30±14	30±9	a vs b p=0.013 a vs c p<0.01 b vs c NS
Fluoroscopy time (min)	34±18	20±10	21±13	a vs b p<0.001 a vs c p=0.02 b vs c NS
Procedural time (min)	181±53	140±53	170±51	a vs b p<0.001 a vs c NS b vs c p<0.001
% of isolated PVs at 30 min (%)	89%	95%	95%	a vs b p<0.05 a vs c p<0.05 b vs c NS

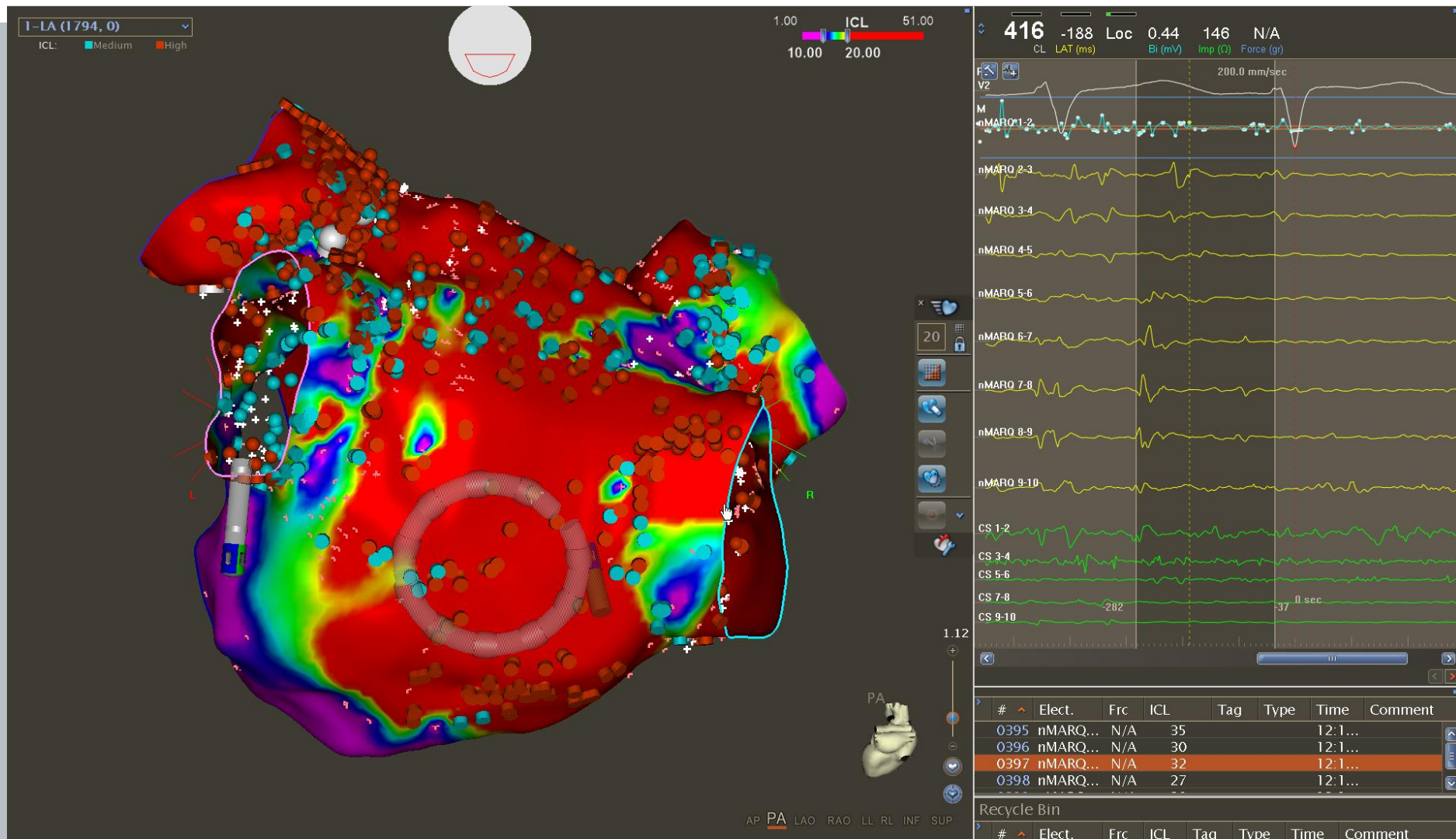


Impact of contact force TactiCath measurement on outcome, reduction of rx and procedure time in AF ablation



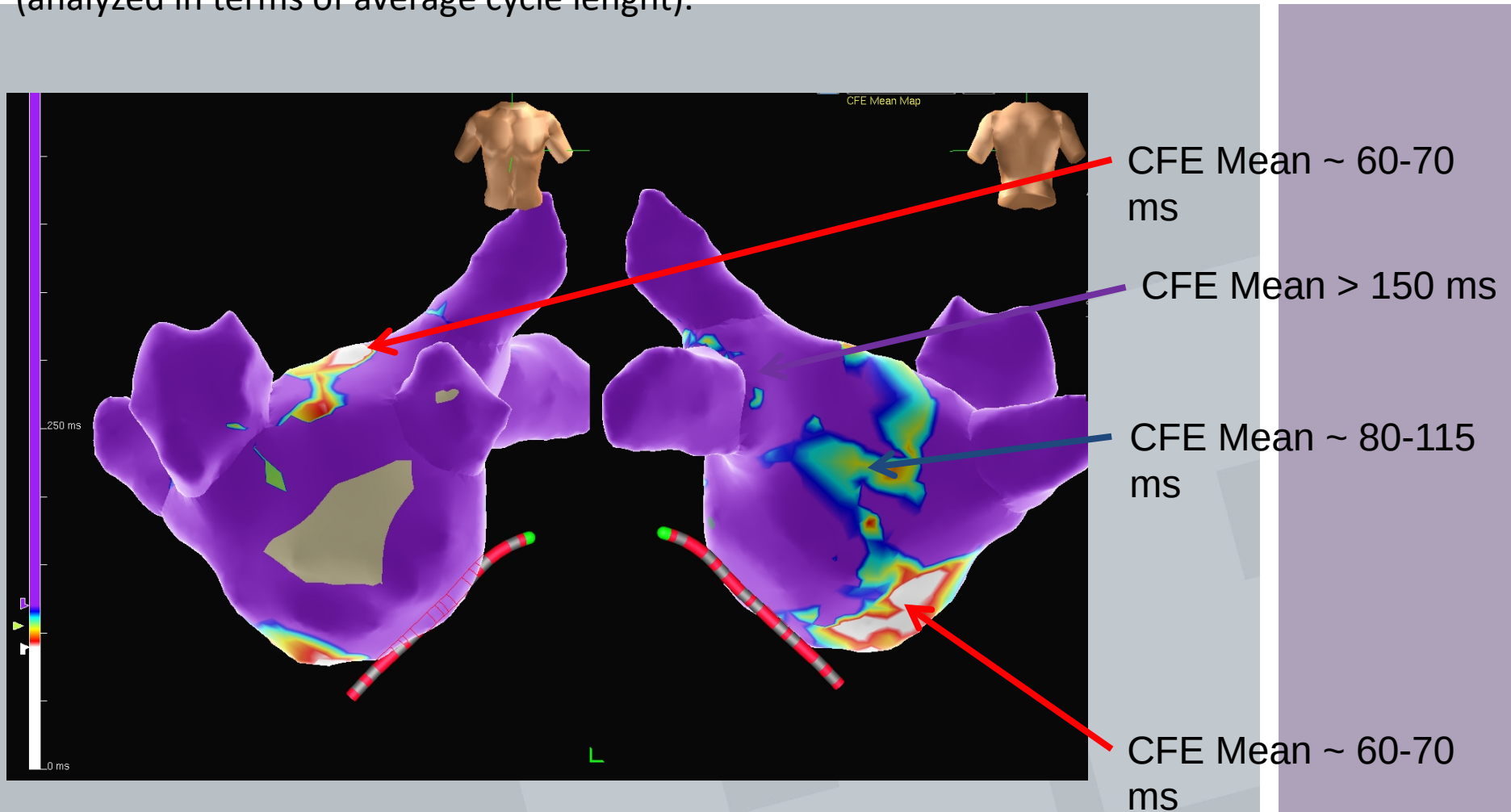
What else
What's next
What is a rotor

CAFE mapping why contact force



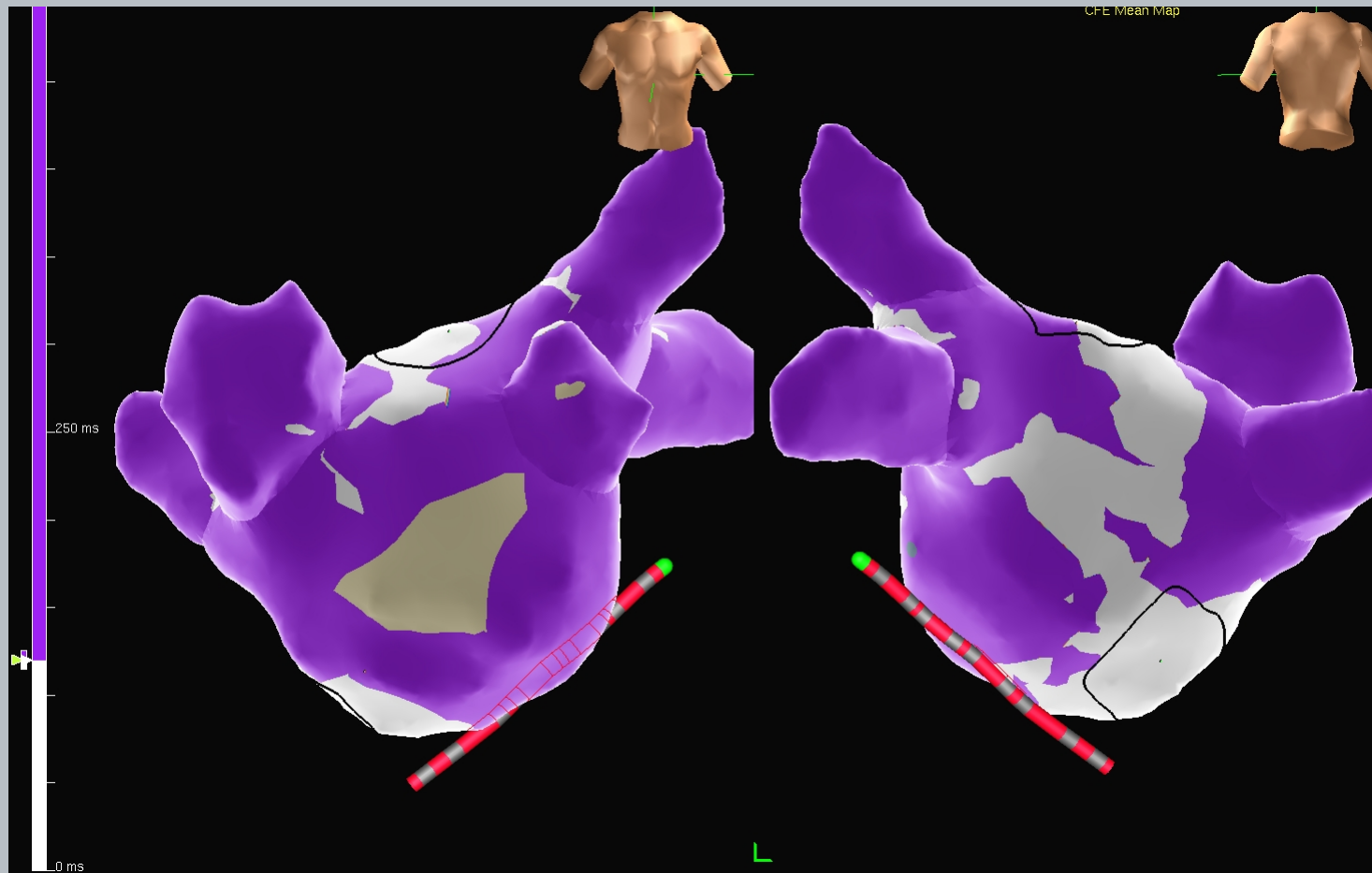
One Map: CFE Mean Map

We have performed a Left Atrium One Map: Geometry+CFE Mean Map. The CFE Mean Map tool enabled us to point out the followings areas which are characterized by fragmented signals (analyzed in terms of average cycle length).



Passively Fragmented Channel

By using a more narrow color scale we can better show the passively fragmented channel

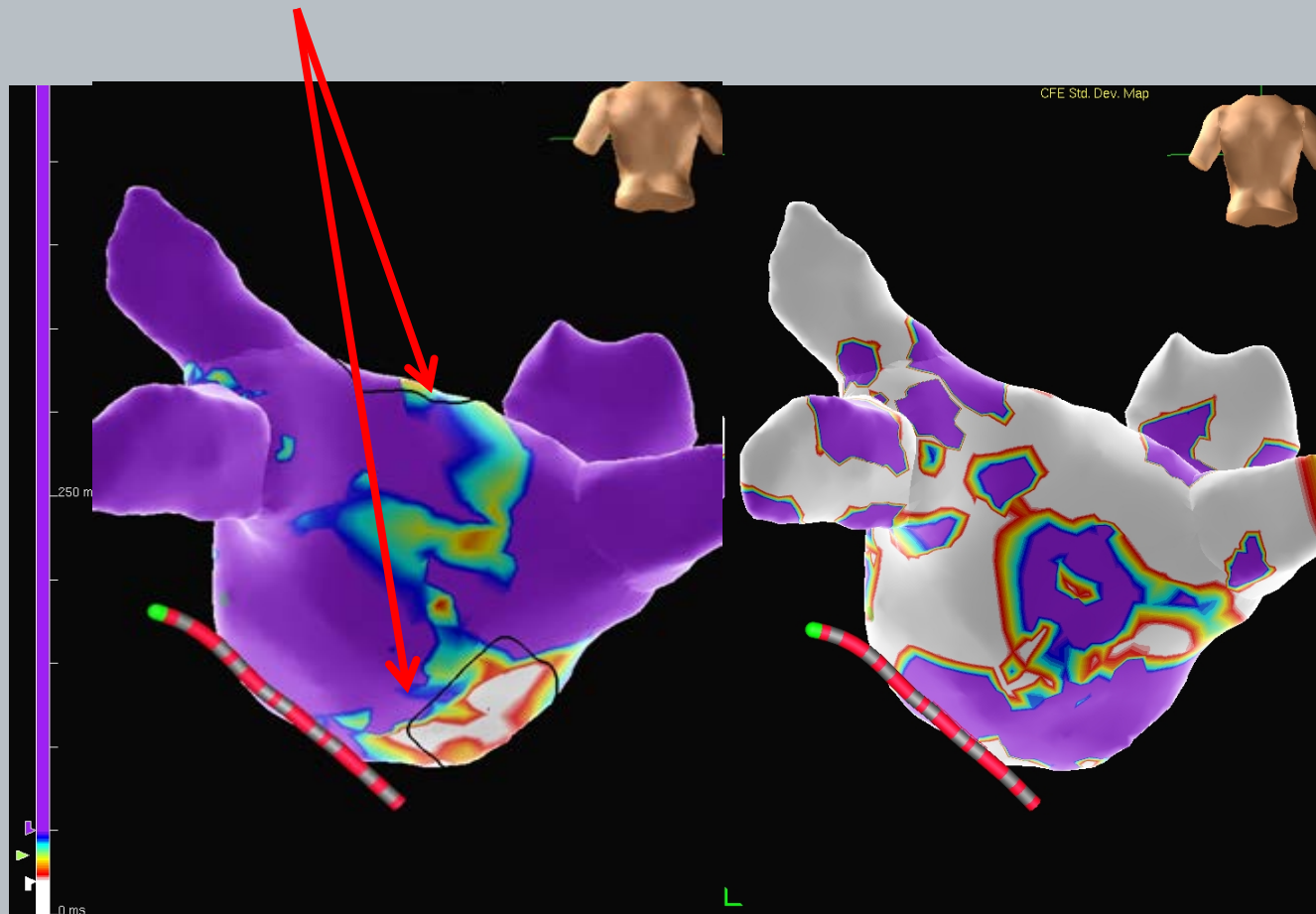


Overlapping Areas and CFE ST. DEV.

We have also performed a CFE Standard Deviation Map in order to point out the most regular activity in the left atrium. By looking at the CFE Mean and the CFE Standard Deviation Map (on the right side), we have found that the two high fragmented areas (placed on the posterior septal wall and on the anterior roof area respectively), have been very regular too (below 20 ms as standard deviation).

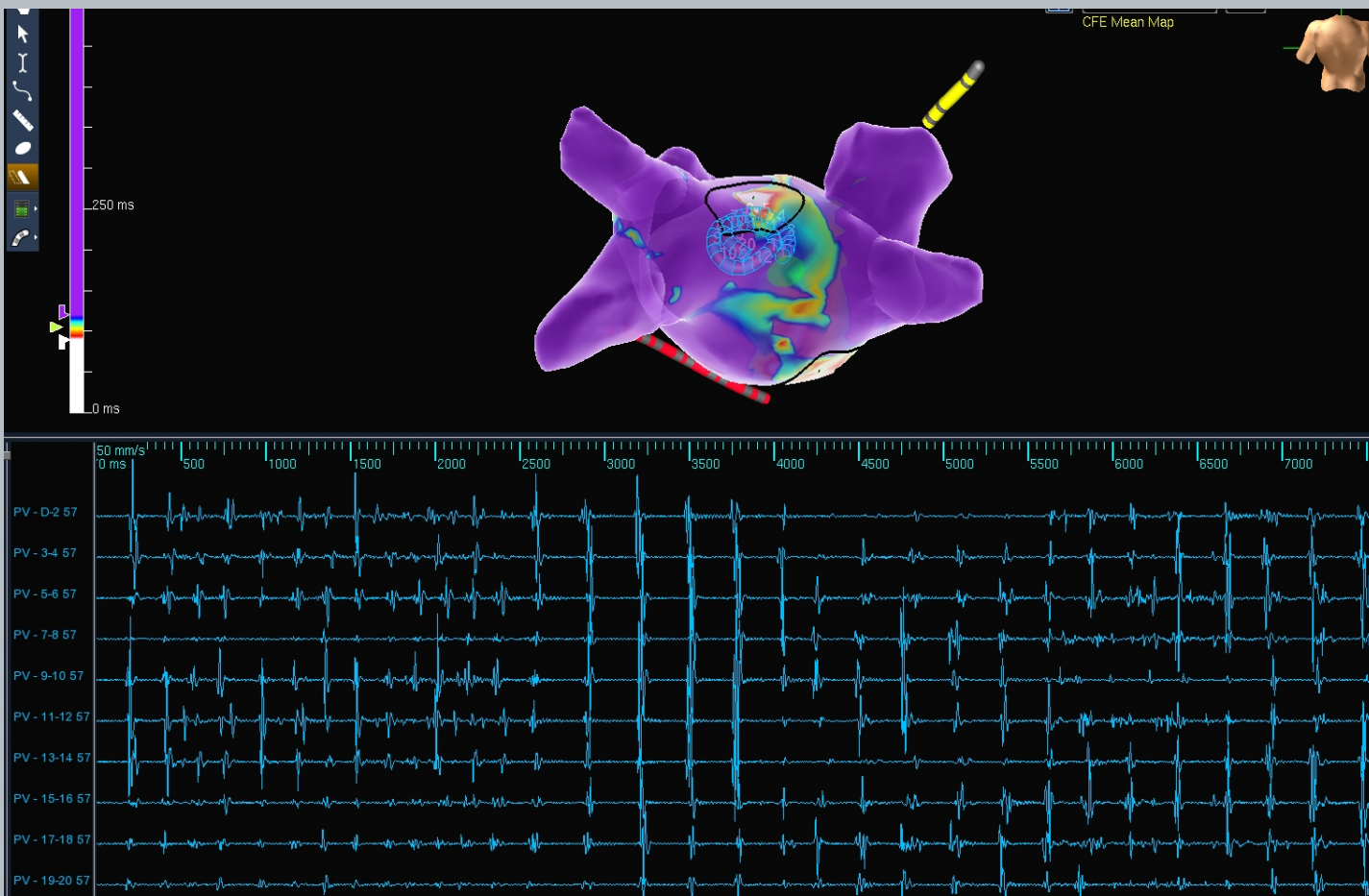
Overlapping areas

CFE St Dev Map



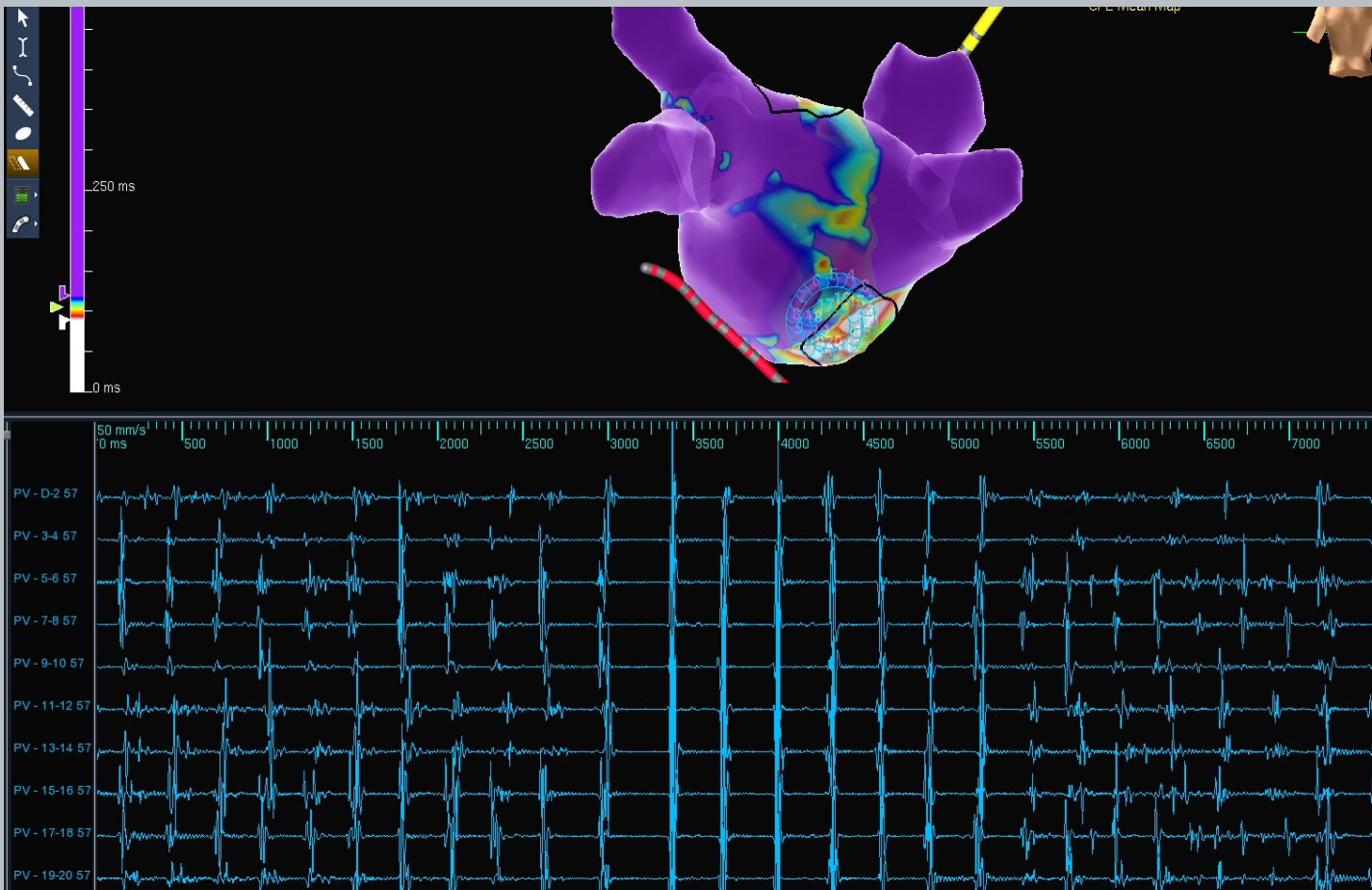
First Rotor

As a consequence we wanted to better study these two interesting areas using a High density Circular Catheter. Firstly we have placed it on the the fragmented area located on the anterior roof. See how this area switches from high fragmented to high fast regular activity



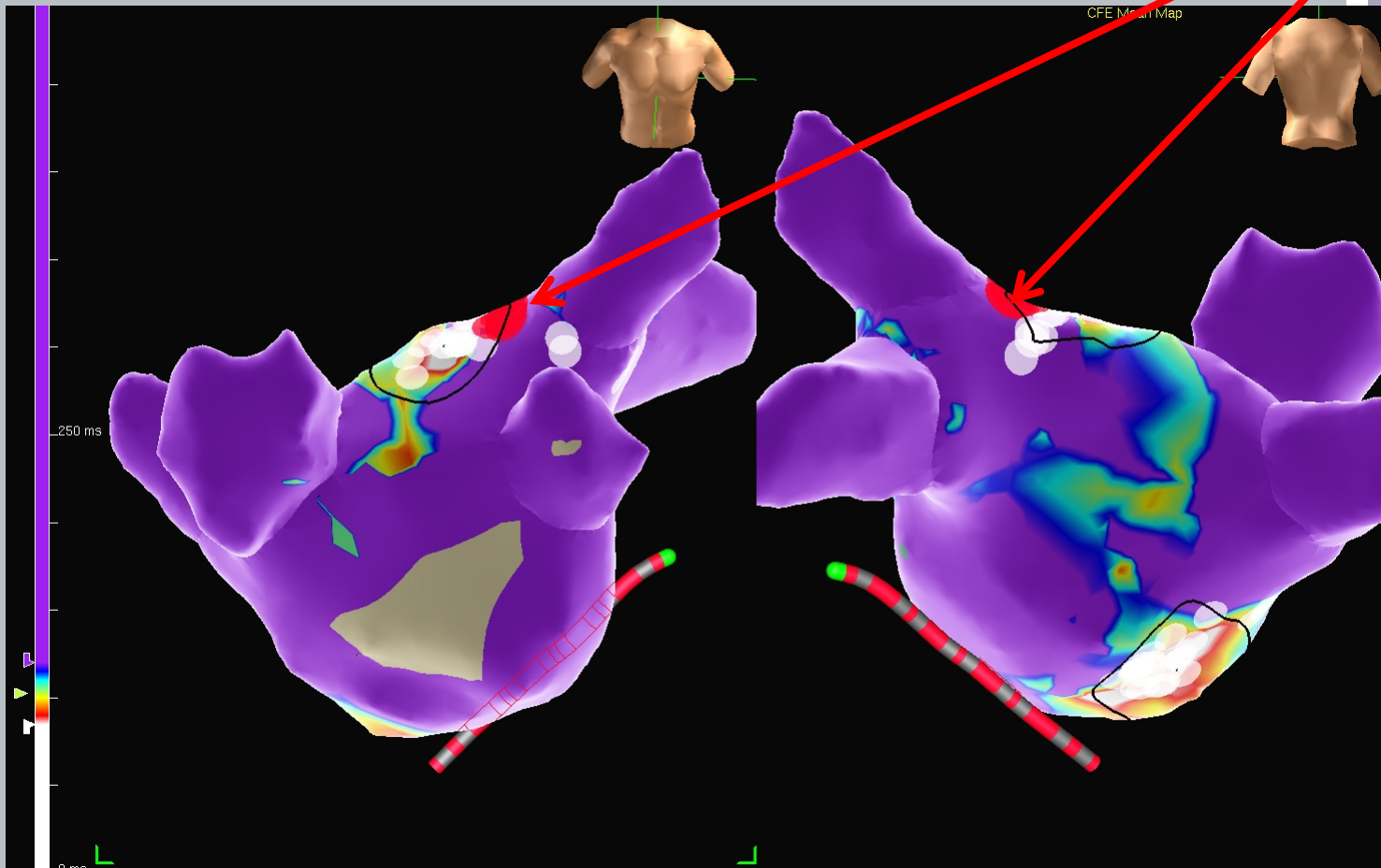
Second Rotor

After then we placed the High density Circular Catheter on the the fragmented area located on the posterior septal wall . See again how this area switches from high fragmented to high fast regular activity



Rotors Ablation

After the mapping phase we have performed the Ablation of the two Rotors by achieving Sinus Rhythm during the ablation of the red coloured area in the image. It was **the earliest activated** area previously described.



Pacing Post Ablation: Not AF

The following burst did not trigger any atrial fibrillations.

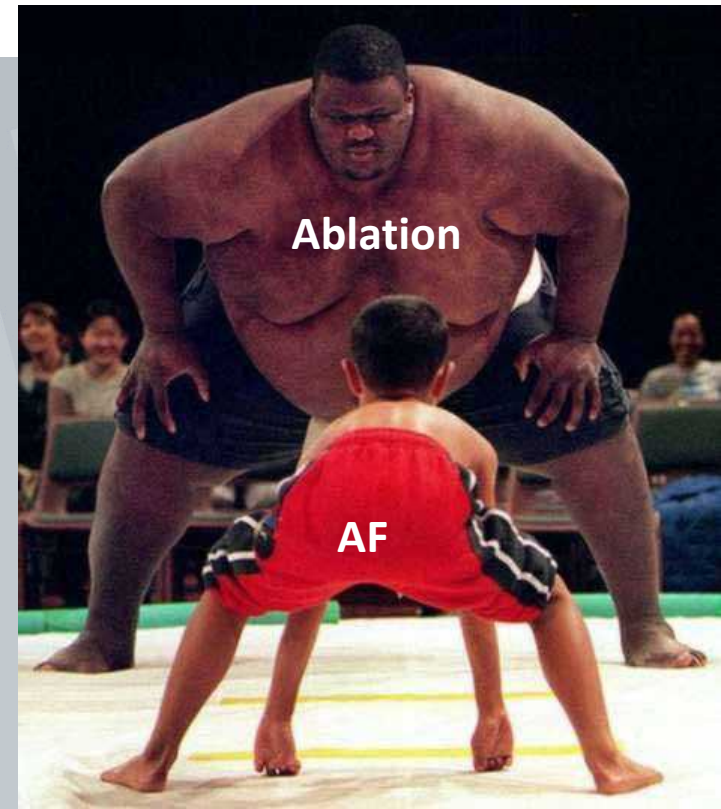
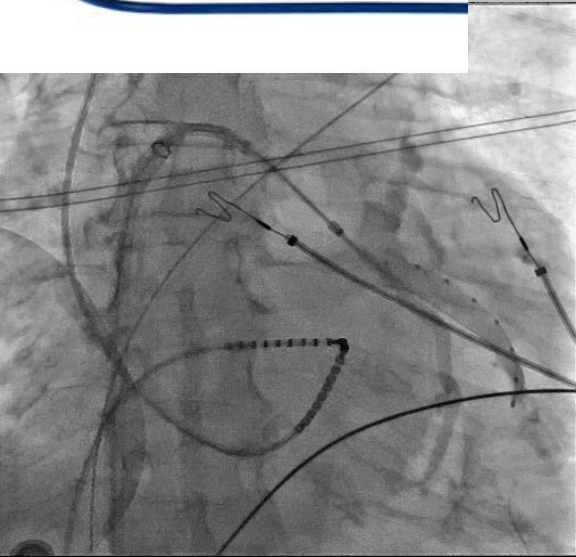
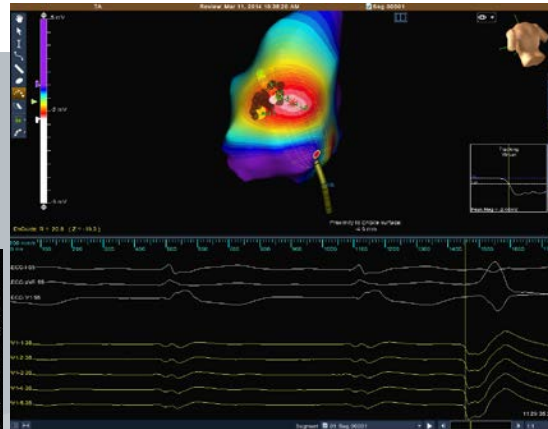


Impact of contact force TactiCath measurement on outcome, reduction of rx and procedure time in AF ablation

Good contact = Good Signal = Good Map = Less Substrate ablation

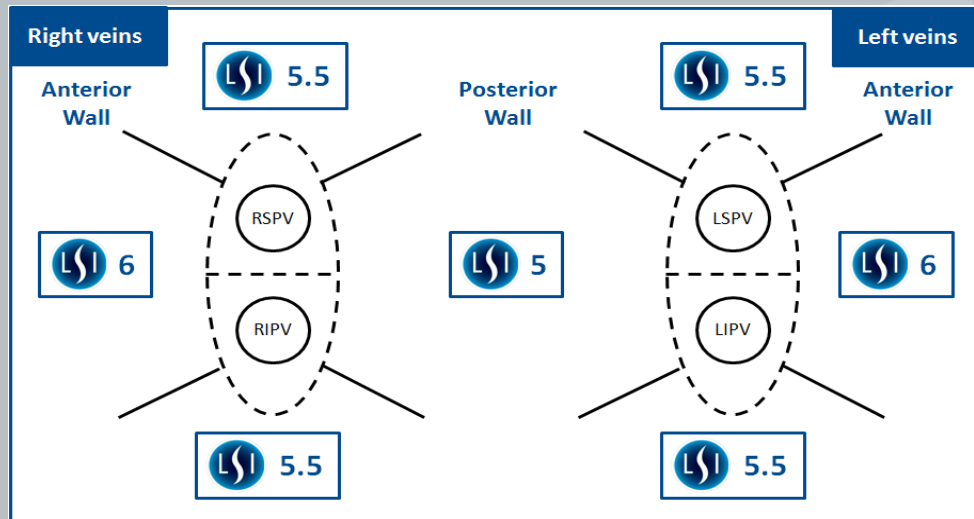
Better outcome > less Time > more safety

Change of Role

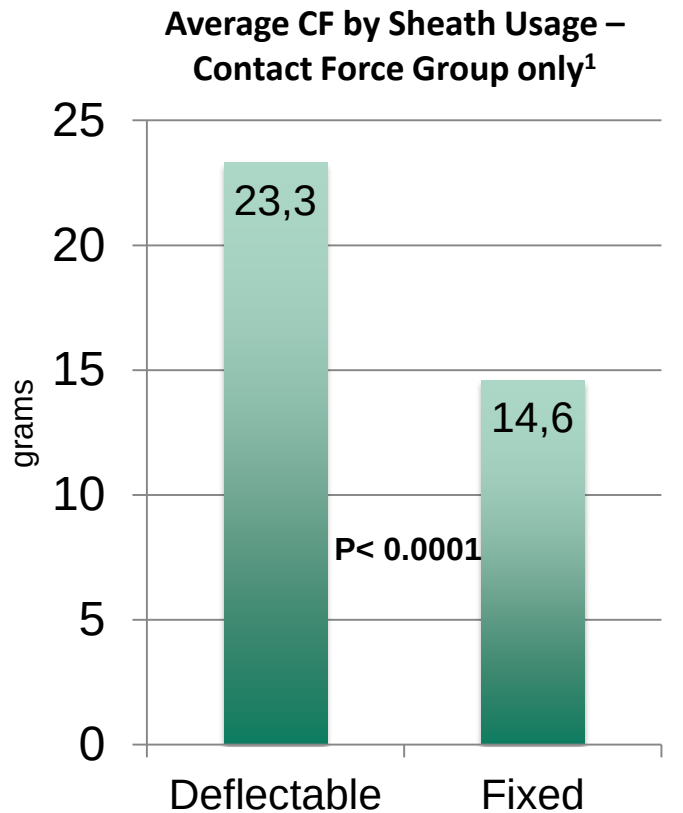


Criteria

1. Substrate mapping should be carried on with contact force sensor
2. Take note of are with not good contact force – >4 (waiting for contact and voltage map on the same panel)
3. Erogate only when contact > 10 g
4. At least FTI > 550 e LSI > 5 (depending on arrhythmias)
5. Remap voltage with unipolar for AF in sites where contact was not optimal)
6. When possible use Agilis or any Steerable sheath

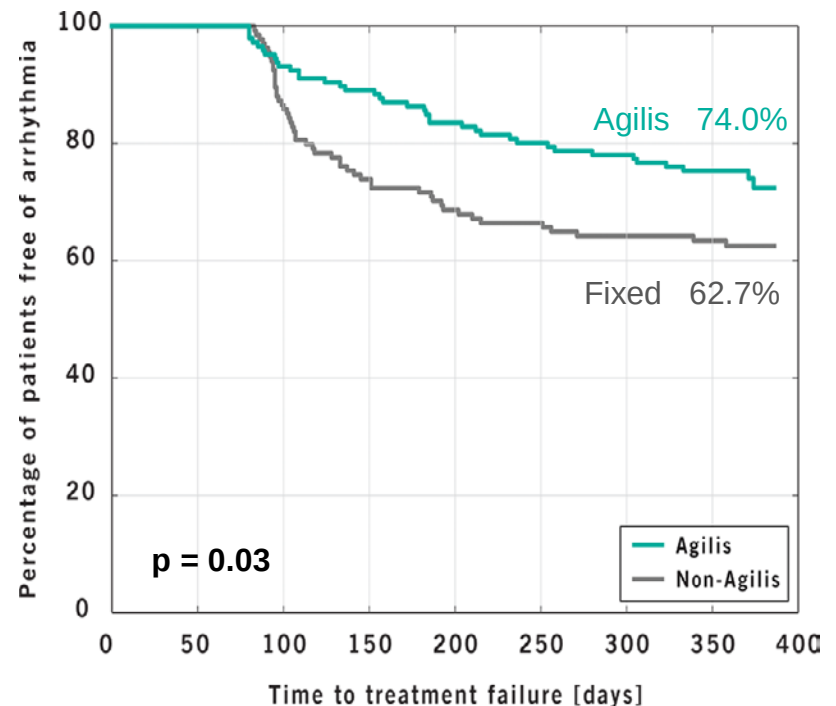


Exploratory Analysis: Deflectable Sheath Impact



- CF subjects treated with deflectable sheath had higher average CF vs. those treated without a deflectable sheath

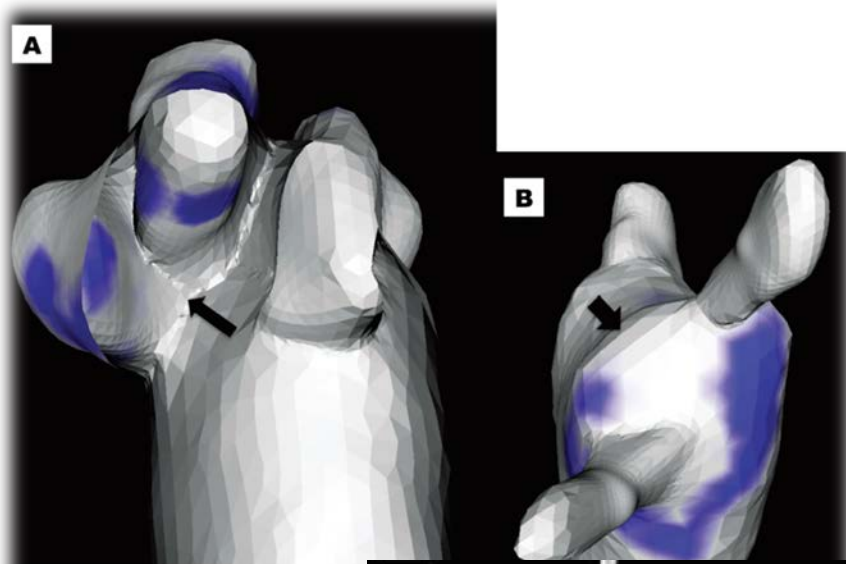
Protocol Defined Treatment Success by Sheath Usage – All Subjects²



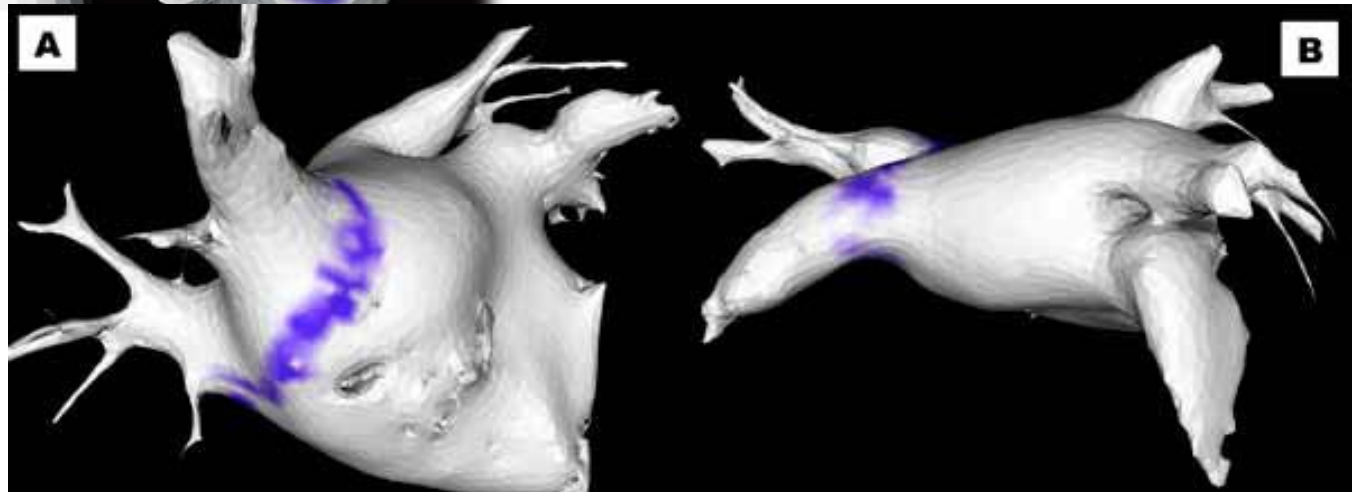
1. Per protocol contact force cohort; CF data unavailable on one patient

2. Per protocol cohort

FTI density map



CF density map



Ragu Vijaykumar, BSc¹, Andrew H. Locke, BA², Stepan Kralovec³, Petr Neuzil, MD³, Edouard Fonck, PhD⁴, David Harari⁴, and Vivek Y. Reddy, MD². Presented at HRS 2011

In conclusion is it a must to ???



In conclusion 2 is it a must to ???



Thank you for attention

I can resist everything except temptation



O. Wilde