

Do we need radioablation  
of ventricular tachycardia ?  
+  
Problems to solve....



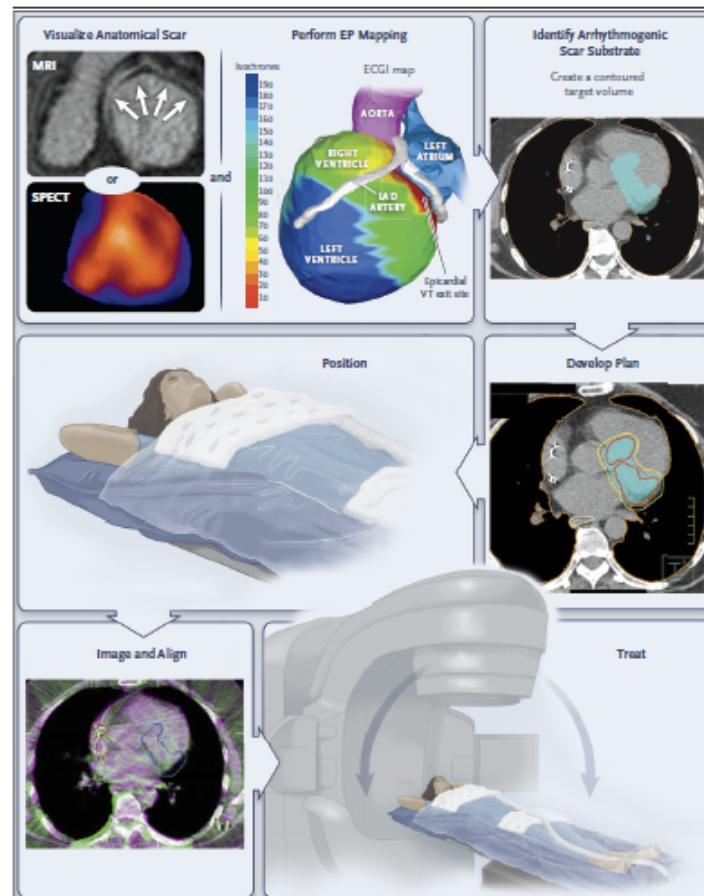
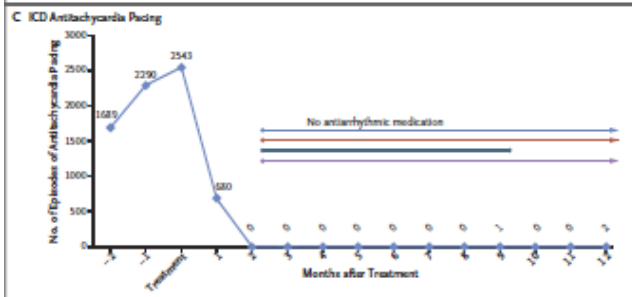
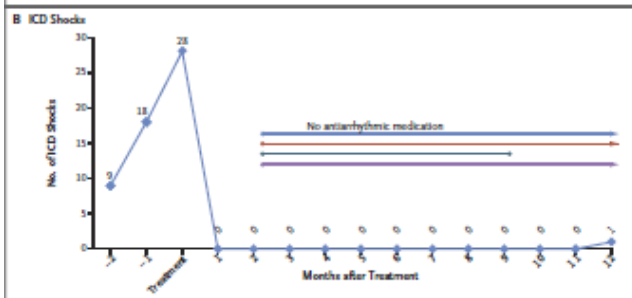
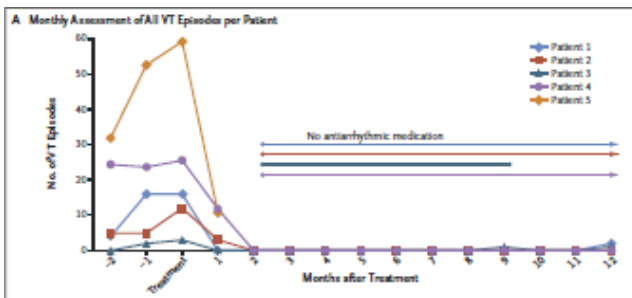
# Conflict of Interest

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None.

# First clinical case series

5 patients with a total of 6577 VT-episodes over 3 pre-radiation months



# ENCORE-VT

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Phase I/II Study for EP-based non-invasive cardiac radioablation for VT

Primary Endpoint:

Safety: Therapy-associated SAE in first 90 days

Efficacy: Reduction of VT episodes (via ICD) or PVC reduction (via 24-h—Holter) in 6 months before/after therapy  
→ 6 week blanking

*Non-invasive multielectrode surface ECG mapping*

# ENCORE-VT

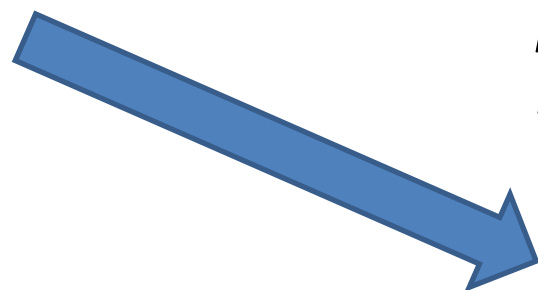
19 patients (17 VT, 2 PVC), > 50% with history of VT storm

Median ablation time 15.3 min (5.4-32.3) → 25 Gy single dose

2/19 with therapy associated SAE (pericarditis/ AHF)

Median VT numbers:

119 (4-292)



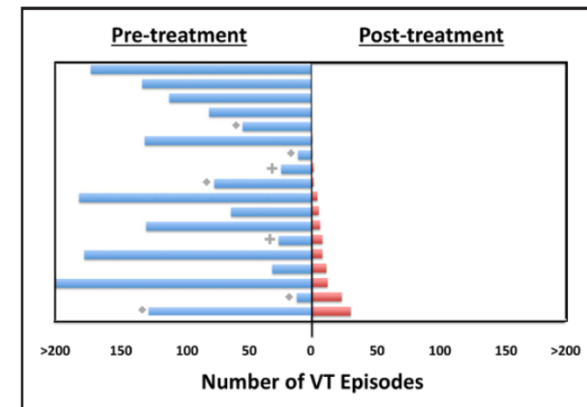
*reduction in 94% of patients  
reduction of 75% in 89% of patients*

3 (0-31)

Less ICD shocks/ ATP/ antiarrhythmics

Survival 6 and 12 months: 89% and 72%

But: 69% late recurrence (6 w – 6 m)



# First European case series

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2014 to 2017 Bail-out after failed VT ablation in 10 patients

3-D-Map-Integration → Definition of PTV (median 22.15 ml)

CyberKnife 25 Gy

**VT-Burden: reduction of 87,5%**

But: Recurrence in 80%, 3 patients with electrical storm

# Complex and challenging conditions

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- Extensive substrate not amenable to effective ablation
  - (Multiple) ineffective catheter ablation(s)
- Epicardial adhesions/ limited epicardial access
- Endocardiac thrombus
- Lack of transmural lesion
  
- Inability to accurately identify the VT substrate
- Substrate inaccessible with current technologies

# Alternative options to RF ablation

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Ethanol ablation

Bipolar ablation

Half-normal saline  
RF ablation

Sympathectomy or  
stellate ganglion block

Intramyocardial needle  
RF ablation

Surgical ablation

(Antiarrhythmic drugs)

Stereotactic Arrhythmia  
Radioablation

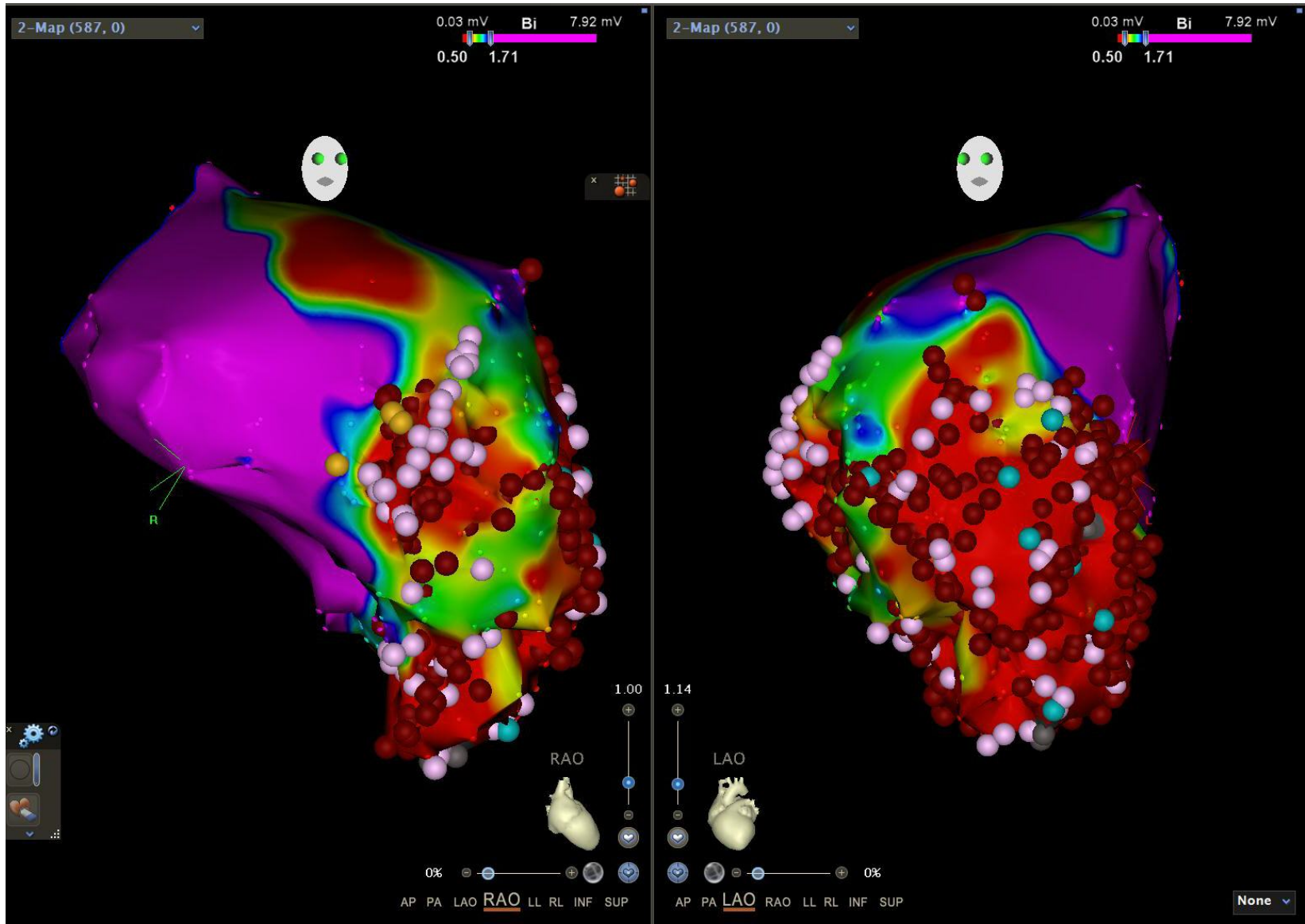


# Do we need stereotactical radioablation of VT?

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YES !

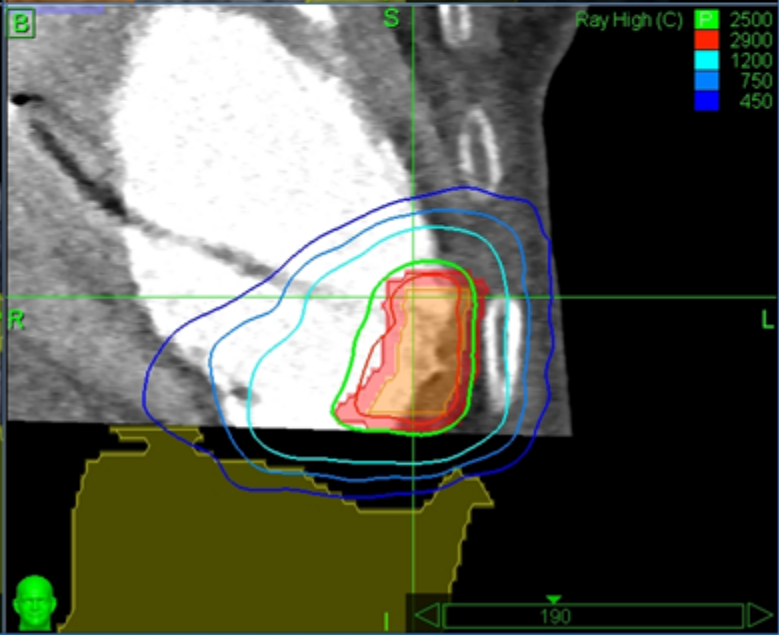
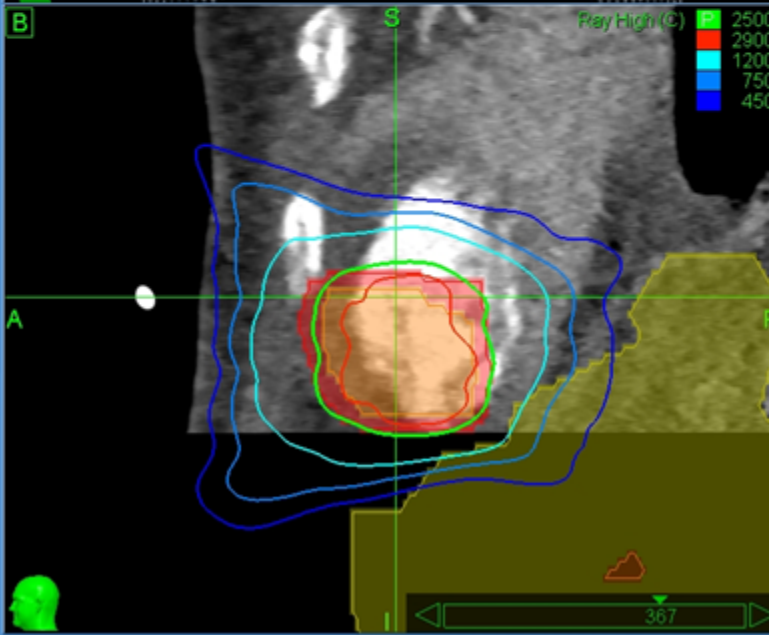
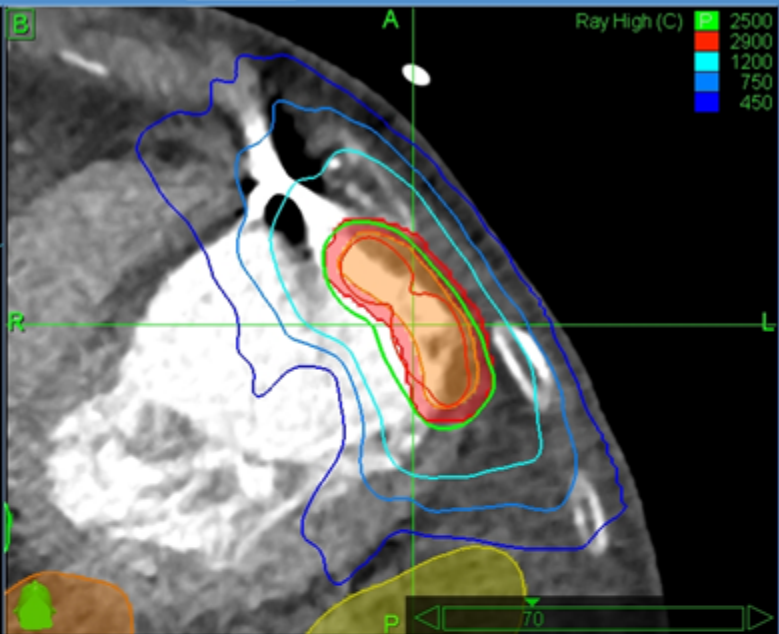
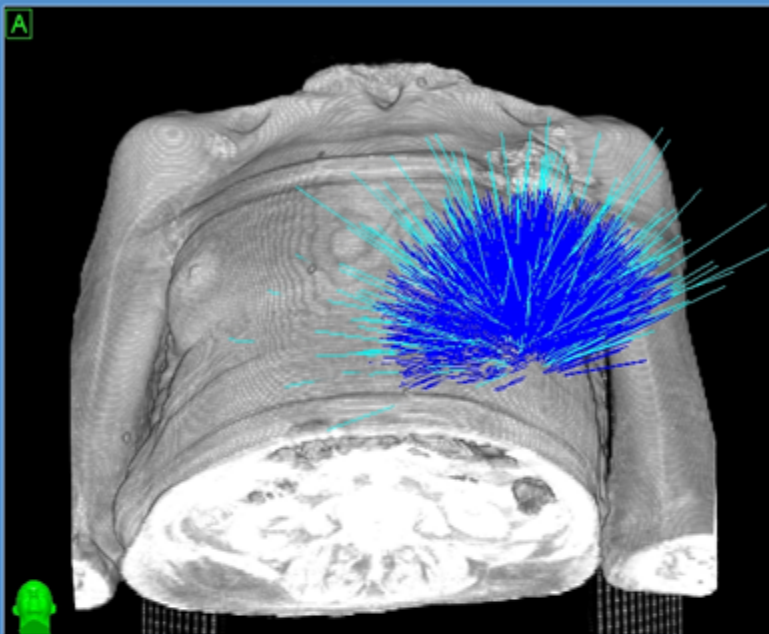
# Scar related VT after myocardial infarction



Show Isocenters  
 Show Beam on 3D

Show 3D VOIs

Show	VOI
<input type="checkbox"/>	GTV
<input type="checkbox"/>	Magen
<input type="checkbox"/>	Colon
<input type="checkbox"/>	ICD
<input type="checkbox"/>	Lunge Links
<input type="checkbox"/>	Lunge Rechts
<input type="checkbox"/>	RV PA
<input type="checkbox"/>	Oesophagus
<input type="checkbox"/>	Spinalkanal
<input type="checkbox"/>	RA
<input type="checkbox"/>	LA
<input type="checkbox"/>	LV endokard
<input type="checkbox"/>	RV
<input type="checkbox"/>	Herz gesamt
<input type="checkbox"/>	Aorta
<input type="checkbox"/>	Trachea Bronchus
<input type="checkbox"/>	Thoraxwand
<input type="checkbox"/>	PTV Fiducial
<input type="checkbox"/>	Spine Tracking



Layouts

3D	DVH	3D	DVH
A	Dose	S	Dose

3D	DVH	3D	A
C	Dose	S	C

Standard Display

Patient  
002334

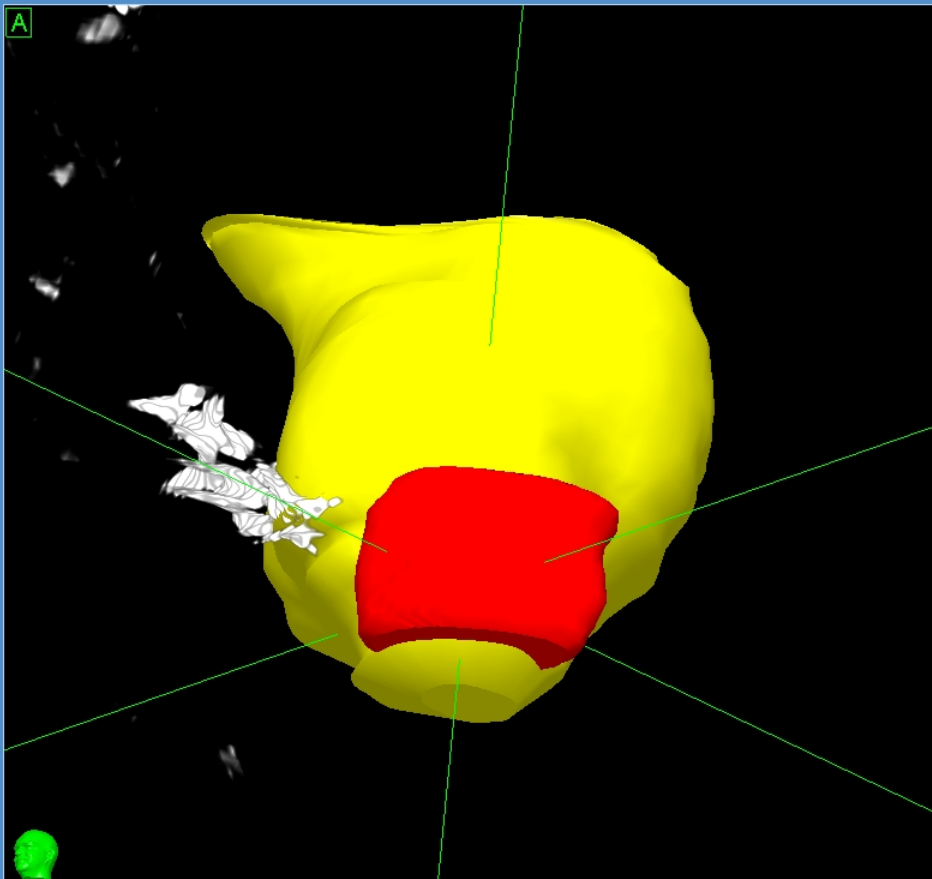
Plan  
25Gy1F\_1020\_RSAWDBDK  
2019-06-26 23:10:23

Rx  
79%, 2500.00 cGy

VOI Opacity

0 100

Display VOI as overlay



VOI Summary

↓ Pri...	☐ S...	Name	Type	Color	Volume (m...
1	<input type="checkbox"/>	GTV	Target	Orange	10217.24
2	<input type="checkbox"/>	Magen	Critical	Red	147628.13
3	<input type="checkbox"/>	Colon	Critical	Yellow	453869.86
4	<input type="checkbox"/>	ICD	Critical	Magenta	109279.22
5	<input type="checkbox"/>	Lunge Links	Critical	Yellow	850934.75
6	<input type="checkbox"/>	Lunge Rechts	Critical	Yellow	1295876.86
7	<input type="checkbox"/>	RV PA	Critical	Yellow	315313.40
8	<input type="checkbox"/>	Oesophagus	Critical	Green	66665.28
9	<input type="checkbox"/>	Spinalkanal	Critical	Magenta	102690.19
10	<input type="checkbox"/>	RA	Critical	Cyan	192808.55
11	<input type="checkbox"/>	LA	Critical	Cyan	374104.72
12	<input checked="" type="checkbox"/>	LV endokard	Critical	Yellow	301024.91
13	<input type="checkbox"/>	RV	Critical	Purple	210529.23
14	<input type="checkbox"/>	Herz gesamt	Critical	Purple	1552556.44
15	<input type="checkbox"/>	Aorta	Critical	Purple	323554.50
16	<input type="checkbox"/>	Trachea Bronchi	Critical	Cyan	37576.13
17	<input type="checkbox"/>	Thoraxwand	Critical	Light Green	67557.04
18	<input checked="" type="checkbox"/>	PTV Fiducial	Target	Red	20117.20
19	<input type="checkbox"/>	Spine Tracking	Critical	Orange	1539980.08
20	<input type="checkbox"/>	Epidermis	Critical	Dark Green	1960000.60
21	<input type="checkbox"/>	Body	Critical	Dark Green	21678205.67

Move Up Move Down Move to Top Move to Bottom

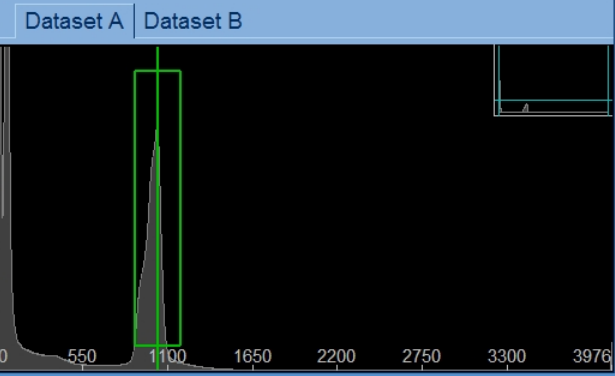
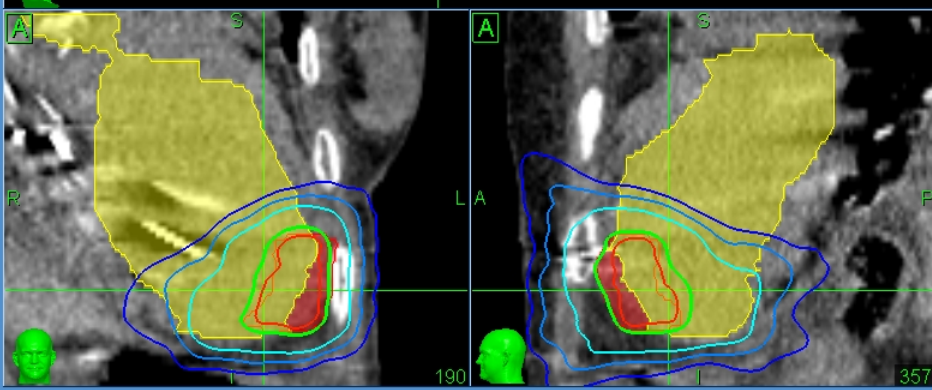
Layouts

A C

C S A S

S 3D

C A C S



# Current problems/

# questions

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Motion/Tracking

Mechanism

Mapping

Dose

Ablation target

Long term efficacy

Integration EP map

Safety profile

CT-/KM-CT accuracy

Workflow

Collaboration EP + Rad







Unbefugten  
ist der Zutritt  
verboten!



## ENCORE-VT

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"These are patients who have typically gone through 8-hour procedures with extended recovery times," Cuculich said. "The last patient we treated on the protocol worked in the morning, came in on his lunch break for his VT ablation, and did a job in the afternoon. He's a plumber. It's a very different way of thinking."